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CONDUCTED BY

Mr. W. NEWTON,

OF THE OFFICE FOR PATENTS, CHANCERY LANE.

(Assisted by several Scientific Gentlemen.)

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No. XCI.

Recent Patents.

To Thomas Robert Sewell, *of Carrington, in the parish of Basford and county of Nottingham, lace manufacturer, for his invention of certain improvements in the manufacture of white lead.*—[Sealed 11th January, 1837.]

These improvements in the manufacture of white lead consist, in the first place, in a mode of combining oxygen with lead, by the agency of the combustion of charcoal, for the purpose of producing a material or substance, commonly called or known to chemists as protoxide of lead, in connection with a mode of preserving and applying the carbonic acid gas, generated by the combustion, to the further purpose of carbonating protoxide of lead. Secondly, in certain improved modes of operating for the purpose of carbonating protoxide of lead, in order to produce the substance or pigment, called ceruse or the white lead of commerce. Thirdly,—in the construction and arrangement of apparatus suited to perform one or both of these operations separately or combined.

As respects the first head of my invention, I place metallic or blue lead in a suitable receptacle, where it is melted by the heated gases produced from the combustion of charcoal, and oxydized by the oxygen of the undecomposed atmospheric air brought over its surface; by means of which operations the lead becomes oxydized, and rendered in a fit state for being converted into the pigment called white lead; and the carbonic acid gas, instead of being allowed to escape into the atmosphere, immediately after passing over the lead, is conducted through pipes, by means of a pump, to the vessel in which the carbonating process is to be performed.

As to the second head of the invention, I place protoxide of lead, prepared as above, and ground and washed (or by any other process which may have rendered it fit for the purpose) in a suitable vessel, containing a solution of acetate of lead, or of acetic acid, or any other suitable solvent of protoxide of lead, and pass through this mixture a current of carbonic acid gas, for the purpose of agitating the mixture, and promoting the action of the solvent upon the oxyde; and when a portion of the oxyde has become dissolved in the solvent, causing the carbonic acid gas to unite with it, and to precipitate ceruse or white lead.

The third head of the invention—the construction and arrangement of apparatus suited to purposes of the above operations—will be best understood by reference to the accompanying drawings, in which fig. 1, Plate I. is a longitudinal section of an apparatus, arranged to conduct the operation from the beginning to the end.

A furnace *a*, containing a quantity of ignited charcoal, is placed contiguous to a vessel or trough *b*, *b*, formed of fire-brick, which is shown in transverse section at fig. 2. This vessel contains a quantity of metallic or blue lead *c*, and is covered by a roof *d*, *d*, of fire-brick, forming a very narrow channel as a flue over the surface of the lead. The furnace is supplied with atmospheric air from the open ash-pit *e*, below, and the oxygen and other gases, as well as the carbonic acid gas, generated from the combustion, pass in a heated state through the vessel *b*, over the surface of the lead, and in passing cause the lead to melt. A quantity of cold air may be admitted, if necessary, at the door *f*, in front, for the purpose of regulating the temperature of the melted lead, which should be kept at a low red heat during the operation.

In the passage of the gases over the surface of the melted lead *c*, oxygen enters into combination with the lead, and converts it into an oxyde. The carbonic acid and other gases, proceeding onward, descend into the chamber *g*, carrying with them the oxyde thus produced, which deposits on the floor, at the bottom of the chamber, (and from thence may be removed when necessary, by opening the door *h*,) whilst the gases pass up through the pipe *i*, *i*.

It will now be necessary to show the means by which I produce a current of air and gases through the furnace *a*, the lead vessel *b*, the chamber *g*, and the pipe *i*, *i*, *i*.

A tank of water is fixed in the masonry at *k*, *k*, and in this is placed an inverted vessel *l*, *l*, supported by bars *m*. A perforated diaphragm *n*, *n*, is fixed within this vessel *l*, which diaphragm may be covered with a sheet of wire gauze, for the purpose of causing the gases, which are to be passed through the diaphragm, to be separated into very minute bubbles. Pure water is delivered into the vessels *l* and *k*, by a pipe from a cistern *o*, which may continue flowing until the tank *k* is filled nearly up to its brim. A wooden vessel *p*, *p*, *p*, (say about six feet diameter and six feet deep,) is furnished with a false bottom of wood *q*, which is perforated with holes, each of about an inch in diameter. This false bottom is placed a few inches from the real bottom, forming a space *j*, between them for the introduction of the gases. Upon the upper surface of the false bottom, a sheet or diaphragm of very closely woven canvass, or wash leather, or other suitable porous substance, is tightly distended, and secured in that situation; or, perhaps, a false bottom of porous wood might answer the purpose. On this diaphragm I place a quantity of protoxide of lead, say a ton weight, and then nearly fill the vessel *p* with a solution, consisting of about nine hundred weight of acetate of lead, dissolved in about four or five times its weight of water; which solution is intended as a menstruum for dissolving the protoxide of lead, and becomes the vehicle for the chemical operation which is to follow; or, instead of this solution, acetic acid, or any other suitable solution of lead, may be employed, but I prefer that above mentioned.

Now in order to carry on the process of making white lead by the apparatus under consideration, I employ an air pump *r*, which is connected by pipes and chambers to the furnace *a*, on one side, and to the vessel *p*, on the other side, as represented partly in section in fig. 1. A pipe *s*, *s*, *s*, leading from the upper part of the vessel *l*, is connected to the induction side of the air pump, and a pipe *t*, from the eduction side, leads into a close air tight vessel *u*, furnished with a weighted valve, to regulate the pressure within.—From this vessel *u*, a pipe *v*, having a regulating stop cock, communicates with the compartment *j*, under the false bottom *g*, in the vessel *p*. The air pump *r*, which is constructed on the double-action principle, is to be worked by a steam engine, or other adequate means, applied to its piston, by the action of which the atmospheric air is drawn from the vessel *l*, through the pipe *s*, and forced through the pipe *t*. On a partial vacuum being thus produced in the vessel *l*, the water will rise in that vessel and descend in the tank to the levels shewn in the drawing; and on the further action of the pump *r*, atmospheric air and the gases produced by combustion in the furnace *a*, will be drawn from the furnace over the surface of the melted lead *c*, through the chamber *g*, and pipe *i*, into the water in the vessel *l*,—and there these gases, rising in bubbles through the water, and through the diaphragm *n*, become washed and cooled before they ascend into the upper part of the vessel, the water in the vessel *l*, being kept continually cool by a jet of cold water from the cistern *o*, the surplus water escaping by the perpendicular pipe *w*, and gage cock *x*, from whence it runs off into a drain.

In the progress of these gases from the furnace over the surface of the melted lead, the oxygen of that portion of the atmospheric air which has not been decomposed by combustion, combines with the lead, and converts it into an oxyde; which oxyde, if not blown off by the draft into chamber *g*, below, may be pushed forward by a rake, and deposited in the bottom of the chamber. And I would here remark, that if the operation should be found not to have brought the lead completely into the state of a protoxide, the material may be again placed in the trough *b*, and be subjected to a repetition of the same operation. The continued action of the pump *r*, will draw the gases from the upper part of the vessel *l*, through the pipe *s*, and force them through the pipe *t*, into the air vessel *u*, where the gases becoming slightly compressed, the vessel will constitute a reservoir for supplying a continuous current of the gases, through the pipe *v*, into the compartment *j*, in the bottom part of the vessel *p*. The gases are, by these means, made to rise through the false bottom *q*, of the vessel *p*, and through the diaphragm of close canvass, or wash leather, or other porous material; and in passing, the gases will be found to ascend in a multitude of streams of exceedingly minute bubbles through the solution, agitating the particles of the protoxide of lead as they pass, and assisting them to dissolve in the menstruum; in which progress the carbonic acid gas enters into chemical combination with the protoxide of lead, held in solution, and causes it to precipitate in the form of ceruse or white lead. This operation may be assisted by agitating the material in the vessel *p*, which may be done by giving rotary motion to the stirrer, having radial vanes.

In the event of the solution in the vessel *p*, percolating through the diaphragm into the compartment *j*, it will be necessary to afford the means for its discharge in a lateral direction, otherwise the gases could not be conveniently forced through the menstruum. For this purpose I apply a pipe *y*, the lower end of which communicates with the compartment *j*, under the false bottom, and the upper end opens into the vessel *p*, near its top.

When the elastic force of the gases, in the vessel *u*, are beginning to act through the pipe *v*, the stop cock in the pipe *y*, must be opened, which will allow the liquor in the compartment *j*, to be forced up the pipe *y*, by the pressure of the gases; and when it has been thus discharged from the compartment, the stop cock must be closed, and the gases will then pass up through the menstruum, as before described.

This process must be continued until the whole of the oxyde has been dissolved, which may be known by the whiteness of the precipitate; and if the operation has been properly conducted, this will take place in the course of ten or twelve hours. The contents of the vessel *p*, should then be transferred into another vessel, and the white lead being allowed to subside, the liquor drawn off may, with a small addition of the solvent, be used again to dissolve the oxyde employed in future operations. The deposit of white lead must now be washed in pure water, in order to remove the remainder of the solvent; and when dried and prepared in the usual way, will be ready for the market.

For the sake of economy, the material taken up by the water in the first washing of the white lead, may be concentrated by evaporation, and introduced into the vessel *p*, in any future operation.

Instead of the vessel *p*, above described, I sometimes employ an apparatus, represented in section, at fig. 3, which is designed to be used when the oxyde of lead, to be operated upon, happens to contain insoluble impurities, as is commonly the case with litharge and massicot: *a*, *a*, *a*, is a deep vessel of wood, and *b*, *b*, a trunk, forming a narrow chamber contiguous to its side; *c* is a box containing oxyde of lead, which, on being introduced into the vessel *a*, rests upon ledges near the bottom of the vessel; and these ledges are packed to prevent any liquid passing up the sides. This box has a perforated bottom, and also a perforated lid, and a filtering diaphragm of wash leather, or other suitable material, is extended over and secured to the internal surface of each. A long pipe *d*, of lead or copper, leads from the upper part of the vessel *a*, into a cask *e*, below, and a short pipe *f*, from the same cask, extends upwards through the bottom of the vessel *a*, each of which pipes is furnished with a stop cock. In the side of the vessel *a*, an aperture is made, which is covered by a flexible diaphragm *g*, of wash leather, or any other suitable porous substance; the edges of the diaphragm being secured by a wooden frame in the inside of the chamber. Into the vessel *a*, is to be introduced a solution of acetate of lead, or acetic acid, and the cocks being opened in the pipes *d* and *f*, the solution is allowed to fill the vessel *a*, the cask *e*, and the pipes *d* and *f*, to within a few inches of the level of the lateral branch *h*, in the pipe *d*. A bent pipe *i*, communicating with the bottom of the trunk or chamber *b*, leads into the upper part of the vessel *a*, and is furnished with a stop cock. A pipe *k*, which is intended to be connected with the pipe *v*, and the vessel *u*, in fig. 1, leads into the upper part of the trunk or chamber *b*, for the purpose of conducting the gases into the chamber, and through the diaphragm *g*, into the vessel *a*. The carbonic acid and other gases being forced by the pump *r*, through the air vessel *u*, and pipe *v*, as before described, in reference to fig. 1, are made to enter the chamber *b*, by the pipe *k*; and the cock of the pipe *i*, being opened, any liquor which may have passed from the vessel *a*, through the diaphragm *g*, into the chamber *b*, will, by the pressure of the gases, be made to pass up the pipe *i*, and to discharge itself into the upper part of the vessel *a*. The cock in the pipe *i*, must now be closed, when the gases, filling the chamber *b*, and swelling the diaphragm *g*, into the vessel *a*, will, by the force of the pump, be passed through the pores of the diaphragm *g*, and rise in a multitude of small bubbles through the solution.

The effect of thus introducing a quantity of gas into the solution, in the upper part of the vessel *a*, will be to raise its column, and cause the liquor to flow through the lateral branch *h*,—and the column of liquor in the upper part of the vessel *a*, thus becoming lighter, the liquor in the cask *e*, and the lower part of the vessel *a*, will be forced upwards through the box *c*, by the pressure of the column in the pipe *d*. The solution or solvent being thus carried up through the oxyde in the box *c*, it will dissolve a portion of the oxyde as it passes, and thus being acted upon by the carbonic acid gas, which proceeds in bubbles through the solution, will cause the white lead to be produced, and carried over by the continued current, down the pipe *d*, into the cask *e*, where it will be deposited.

In employing these parts of the apparatus described above, in which the oxyde is dissolved and the white lead formed, it is not absolutely necessary to connect them with the furnace and vessel in which the lead is oxydized, and the carbonic acid gas generated, as described in reference to fig. 1; for if the lead were to be properly oxydized by any other suitable process, and if carbonic acid gas were to be generated by any other means, and the two substances be brought to act upon each other in the manner described, a very important part of my object might be effected.

I therefore desire it to be understood, that the particular features which I claim as my invention, under the above recited letters patent, are, first, the mode of heating metallic or blue lead by the combustion of charcoal, in order to dispose it to take up or combine with the oxygen of the atmosphere, which is drawn through the furnace in connection with the retention and application of the carbonic acid gas so generated, to the purpose of carbonating oxyde of lead, as described above; second, the mode of operating upon oxyde of lead, for the purpose of converting it into ceruse or white lead, as described above; and third, the construction, arrangement, and adaptation of apparatus capable of effecting those objects as set out in the drawing hereto annexed, as described above.—[*Inrolled in the Rolls Chapel Office, July* 1837.]

Specification drawn by Messrs. Newton and Berry.

To Louis Mathurin Busson du Maurier, *of Lombard Street, in the City of London, gentlemen, for an invention of improvements in the construction of springs for carriages, being a communication from a foreigner residing abroad.*—[Sealed 3rd January, 1839.]

These improvements in springs for carriages, consist in a combination of levers and slides, in conjunction with peculiarly shaped springs. The advantage to be derived from such improved system, is the lessening of the number of springs, and at the same time preventing stage coaches, or any other vehicles to which these improved springs may be applied, from overturning, even though one of the wheels, on the same axletree, were to be twelve inches higher than the other.

In order to make the improved system of springs more readily understood, I have represented, in Plate I, several views of parts of a coach, or other vehicle, to which the said improvements are adapted.

And I would here remark that, although I have represented a three-bodied coach or diligence, to which the improvements are applied, it is evident that the same may be adapted to any four-wheeled vehicle; and I shall afterwards describe a method of applying the invention to a two-wheeled carriage.

In all the figures of the accompanying drawing, the same letters of reference indicate similar parts.

Fig. 4, represents a longitudinal elevation of a three-bodied coach or diligence, with the invention applied thereto. Fig. 5, is a plan or horizontal view of the framing of the carriage, the body and the wheels being removed in order to avoid complexity. Fig. 6, is a view of the hind-wheel part of the carriage, the body of the coach being only partly indicated by an outline: in this figure, the carriage is supposed to be travelling on a level road. Fig. 7, is a view of the same part of the carriage; but in this figure one of the wheels is seen to be considerably higher than the other, perhaps from being elevated on a bank; and it will be seen that the axletree is greatly inclined, although the body of the coach remains in a horizontal position.

A, A, is an iron or wooden bar, supporting the springs B, B, which are connected with the levers C, C, by means of links or bridle pieces D, D, that are attached to the ends of the said levers. The bar A, is placed transversely under the body of the carriage, and just above the axletree: this bar is wider than it is thick, and is so situate that you see its width in the drawings. A similar bar is fastened to the sides of the body of the carriage, both at the front and hind part. The levers C, C, are mounted in bearings, made on the under part of the said bar A, and the springs B, B, are fastened together, at their centre, by a stay, with screws and nuts. The upper spring being the larger, bears directly on two friction plates *b*, *b*, screwed on the bar A; the lower spring bears on an elastic plate *c*, *c*, and at each extremity of the springs a friction roller may be placed so as to render their motion more easy. C, C, are levers mounted in the under part of the bar A, A, as above described; one end of these levers being connected at the point *f*, *f*, with the link or supporter D, the reverse end being made forked at *g*, as will be hereafter described.

The double links or supporters are jointed, at their lower ends, to the short arm of the lever C, at *f*, as before mentioned, and are united over the top of the springs B, B, on which they both bear, by a screw, bolt, and nut.

At each end of the links D, D, there is an increase of thickness to allow of a recess being bored to receive the head of the levers C, C, jointed to the said links D, D. This is done to strengthen the links, and to prevent the whole weight of that part of the carriage from bearing on the joining bolt, and to avoid the danger of their being broken. E, E, are two curvilinear slides, in which a friction roller F, runs; this friction roller is mounted in the fork *g*, at the end of the levers C, C. These slides are fastened by their feet to the axletree, and a supporter G, strongly fastened on the axletree, or on the cross-bar, supports the slide at its outer end. The curve of these slides is calculated according to the degree of inclination it is desired the coach should stand at, and may be so constructed as to allow the carriage to support an inclination of about thirty inches without overturning. In order to prevent the friction roller F, from wearing too rapidly, it may be made of iron, case-hardened, or of steel, or cast iron.

H, H, fig. 4, and 5, are stays, fastened by one end to the springs B, B, and by the other to the beam of the carriage, or to the other axletree. These stays are used to prevent the springs B, B, from deviating from the vertical, and inclining either forward or backward, in cases of ascent and descent.

In many carriages the fore wheels are not united to the hind wheels by a beam, or by swan necks. The present system would also be applicable to such carriages, as well as to any other construction of four-wheeled carriage: in that case the body would be linked or chained to the fore and hind parts of the carriage framing, by rods or chains, as at H, H, fig. 4, and 5.

The same system might easily be adapted to two-wheeled carriages, by placing the above described apparatus on a frame instead of placing it upon the axletree.

The action of these compound springs is as follows:—When the carriage runs on level ground, the elasticity of the springs B, B, is sufficient to prevent any shaking of the body of the carriage, the links preserving always the vertical position, and the rollers F, of the levers C, C, bearing on the middle of the slide E, as shewn in figure 6. But when one of the wheels is higher than the other, then the lever near the lowest wheel rises in the slide, and the lever on the highest wheel descends in the same proportion, as shewn in figure 7. Thus the levers C, C, always preserve the same horizontal position, and thereby maintain the body of the coach horizontally, and the roller F, gradually resumes its former position as the wheels get on even ground.

In conclusion, I wish it to be understood that I do not claim the method of transferring the weight of the carriage to the springs B, B, by means of the levers C, C, and bridle pieces D, D, as I am aware that carriages have been hung by levers acting on springs; but I claim, as the invention secured to me by the present letters patent, firstly, the use and adaptation of the slides E, E, as connected with a system of springs for carriages; and secondly, the arrangement of the several parts together, with the slides E, E, by means of which I can construct a system of springs, as above described, which will, in a great measure, prevent carriages being overturned.—[*Inrolled in the Rolls Chapel Office, July* 1839.]

Specification drawn by Messrs. Newton and Berry.

To CALEB BEDELLS, *of Leicester, manufacturer, for improvements in gloves, stockings, and other articles of hosiery.*—[Sealed 21st January, 1839.]

MY invention relates to a mode of applying elastic bands of india rubber (caoutchouc) web in the making of gloves, stockings, and other articles of hosiery, and consists in placing such webs on the needles of stocking or knitting frames, and producing thereon knitted fabrics, such as gloves, or stockings, or night caps, or other fabrics, produced in knitting frames.

And, in order to give the best information in my power of the precise nature of my invention, and to distinguish it from other modes of applying the elasticity of india rubber to gloves, stockings, and other articles of hosiery, and that the invention may be readily performed, I will, in the first place, observe that I am aware that elastic bands, containing india rubber, have been before applied to gloves and other knit articles in various ways; first, by enclosing strands or threads by sewing them between two woven fabrics or other substances, such as leather, and applied to gloves and other articles of hosery; secondly, obtaining double fabrics by weaving, and strands or threads of india rubber have been drawn between such double fabrics, and such bands have been applyed by sewing to various articles of hosiery; thirdly, elastic webs or bands have been obtained by weaving india rubber threads, and by means of sewing, such bands have been applied to various articles of hosiery; and fourthly, strands or threads of india rubber have been applied or introduced into stockings, gloves, and other articles of hosiery, in the act of making such fabrics, and by means of a long needle, or such like instrument, drawing threads of india rubber through the several rows of stitches or loops as they are formed in knitting frames, and by this means producing elastic tops to stockings and other articles of hosiery.

Now my invention consists in taking elastic india rubber webs or bands, prepared suitably for the purpose of running them on to the needles of stocking or knitting frames, and working the knit fabrics thereon.

The elastic fabrics, webs, or bands, I prefer for the purposes of my invention, are such as are produced in looms working with shuttle and warp, and are well known and used for a great variety of purposes; and in weaving such webs for the purposes of my invention, the warp threads of india rubber may be covered in suitable covering machines, or they may be uncovered: thread covered in the act of weaving, as is well understood in weaving such elastic bands or webs, and the warp of such fabrics, may be wholly of india rubber threads, or partly of india rubber, and partly of threads or yarns of cotton, silk, or other fibrous substances. And I would state that I do not confine myself to any particular description of elastic bands of india rubber, nor does the making of such bands constitute any part of my invention.

In weaving bands containing threads or strands of india rubber, to be used according to my invention, I so arrange the warp that there is a strong thread of cotton, or other material, next to the selvage, warp thread, or yarn, which strong thread is to be drawn before running the band or web on to the needles of a stocking or knitting frame.

By this means, when such thread is drawn, the selvage warp thread, or yarn, stands at a distance from the other warp threads; and the fabric from which such warp thread has been drawn will simply consist of the weft threads, which will offer an open fabric for the passage of the needles, and the web or band so prepared may readily be run on to the needles.

It is well known that in making elastic webs, or bands, by the application of india rubber, that the threads or strands of that material are used when in a stretched and non-elastic state; and elasticity is obtained thereto by the application of heat.

And in using such bands, or webs, according to my invention, I prefer them to be in their elastic state; and in working according to my invention,—supposing I am about to make a glove, or a stocking, or other article of hosiery,—I take a length of india rubber web, of the length I desire the band to be, and stretch it out to the width of needles of a stocking frame, according to the size I desire to make the top of the glove, or stocking, or other article; and by a wire or other stretcher, having points at the ends, I keep the elastic band stretched out to the desired width. I then run the selvage of the band over the heads of the needles, and commence working with the stocking or knitting frame, in the ordinary manner, by the hand or thread carrier, laying thread on to the needles, which, by means of jack and lead sinkers, is depressed between the needles, and passed into the eyes, or under the beards thereof, as is well understood, and the presser bar closing the beards allows of the elastic band, or web, to be thrown or knocked off the needles; and the loops of thread produced, as above explained, will thereby be drawn through the elastic band; and in the working of the machine these loops will be carried back on to the stems of the needles, and the hand or thread carrier will lay a fresh quantity of thread on to the needles, which will be sunk between them by the sinkers, and the previously formed loops or work will be then thrown off the needles in the ordinary manner. The knitting of the glove, stocking, or other article, will then be gone on with in the usual way of making such work in knitting frames: and in respect of stockings, or other articles, it will only be desirable to remark, that in using elastic bands, according to my invention, it will not be necessary to make the top of the stocking double at the top by turning over a portion thereof as is now practised; and such is the case with gloves and socks, and other articles of hosiery, where one part has in like manner been folded over.

From the foregoing description it will readily be understood that various articles of hosiery may have elastic india rubber bands produced thereto in stocking or knitting frames; for, whatever be the article to be produced, whether stockings, gloves, socks, or other articles of hosiery, it will only be necessary to commence working by putting a length of elastic india rubber band, or web, on to the needles, and then producing the article in the usual way of making. I would remark, that in case it is desired to have an elastic band between two portions of knit fabric, in such case I weave the elastic band with a draw thread at each selvage; and first work by putting one selvage on the needles, and producing the quantity of knit fabric on that selvage which may be required; and having taken the work off the needles, I run the other selvage of the elastic band on to the needles, and produce the quantity of knit frabric required on the selvage.

I would remark, that although I have described a particular mode of making the elastic bands of india rubber for the purposes of my invention, I do not confine myself thereto; and although I prefer commencing the work by putting the previously made web on to the needles, it will be evident that the web may be put on to the knit fabrics before taking them out of the knitting frame, by running a width of elastic india rubber band, or web, on to as many needles as have been at work, and have knit fabric thereon, and drawing the last loops through the elastic fabric or web; and then by the operation called "binding off," the loops may be successfully drawn through each other and fastened, or a fastening of the knit fabric and the elastic fabric may be accomplished by passing a thread of cotton or other fibre through the row of loops of the stocking fabric, which have been previously drawn through the elastic fabric, as above explained; and by fastening on each side, the two will be made fast. I do not, however, confine myself to a particular mode of combining elastic webs (prepared by other means than the stocking frame) with stocking fabrics, so long as the combination takes place in the working of knitting or stocking frames or machines.

Having thus described the nature of my invention, and the manner of performing the same, I would have it understood that what I claim as my invention is the mode herein described of applying elastic india rubber bands in the making of gloves, stockings, and other articles of hosiery. [*Inrolled in the Inrolment Office, March*, 1839.]

To PENNOCK TIGAR, *of Grove Hill, in the parish of St. Nicholas, in the liberty of Beverley, in the county of York, merchant, for his invention of certain improvements in the construction and arrangement of iron or other metal wheels, for carriages.*—[Sealed 13th January, 1834.]

THESE improvements consist in a peculiar mode of fitting the spokes of metallic wheels to their naves and felloes, by means of screws formed on their ends.

Plate I., fig. 8, represents the section of a wheel taken transversely through its diameter. *a*, is the nave or box of the wheel formed of metal; *b*, *b*, the felloe also of metal; *c*, *c*, *c*, *c*, the spokes, made of cylindrical rods of metal. Holes are drilled in the nave or box in oblique directions, and tapped with screw threads, the ends of the spokes having corresponding threads.

In forming the wheel the spokes are inserted in the oblique positions shewn, for the purpose of resisting lateral force. They are first screwed a considerable distance into the nave, sufficiently for to allow of the felloe or rim of the wheel being brought over the outer ends of the spokes; the spokes are then, by unscrewing, or turning the reverse way to that in which they were inserted, partially withdrawn from the nave, their outer ends by that means becoming screwed into the rim or felloe.

The Patentee merely claims, as his invention, the mode of fastening the spokes into the nave and felloe, by screwing, as described.—[*Inrolled in the Rolls Chapel Office, July*, 1834.]

To CHARLES FLETCHER, *of Stroud, in the county of Gloucester, mechanist, for certain improvements in the construction of looms for weaving.*—[Sealed 5th March, 1838.]

THESE improvements in the construction of looms for weaving consist, firstly, in the peculiar arrangement or disposition of the working parts of such looms as are to be driven by steam or other rotary power, and in the particular adaptation of such arrangement of parts to the purposes of weaving woollen cloths; secondly, in the introduction of certain new parts or pieces of mechanism into looms in general, by means of which I obtain considerable advantages as to speed and uniformity of work, especially as regards the weaving of woollen cloths.

By these improvements I am enabled to weave better cloth by power than has hitherto been accomplished by hand, the work being much firmer and stouter; and the mechanism affording the capability of making many more "picks" per minute, and causing less breaking of the warp threads, thereby producing a fabric of better quality, and in greater quantity, in a given time.

In this improved construction of loom, the yarn beam or roller, upon which the warp is placed, is situated at the bottom of the framing of the machine; and the work beam or roller, upon which the woven cloth is wound up, is placed at the top, so that the warp threads proceed through the headles or healds in vertical positions; while the harness, for dividing or shedding the warp, slides horizontally in suitable bearings attached to the framings of the loom.

The batten or slay, for beating up the weft threads, is made to rise and fall vertically by the action of suitable cams and levers, and is impelled upwards by the momentum of a falling weight or weights, which can be so regulated or adjusted as to increase or diminish the blow, as may, under circumstances, be found desirable.

This part of the mechanism is also furnished with suitable elastic regulating stops for the rising batten to strike against at the same time that it is closing or beating up the cloth, and by the elasticity of these regulating stops, the sudden concussion of the batten, and consequent strain upon the warp threads, is immediately relieved; whilst the blow being caused by a descending weight, (mounted upon the end of a graduated lever attached to the cam shaft,) any degree of impulse can be given to the batten, without causing an undue strain upon the warp threads, and with much greater effect upon the work than can be obtained by the best hand weaving.

In order to illustrate my improvements in the construction of looms, and that they may be more definitely explained, I have represented such views of my improved loom as will render its peculiar arrangement and novel features sufficiently evident.

Plate II., fig. 1, is a side or end elevation of the loom; fig. 2, a plan or horizontal view of the same, as seen from above; fig. 3, a back view of the loom; and fig. 4, is a vertical section taken transversely through, about the middle of the loom, at the dotted lines A, B, in fig. 3, similar letters of reference being marked upon corresponding parts of the machinery, in all these figures.

The side frames, in which the ordinary parts of the loom are mounted, are represented at *a, a, a, a,* being connected by cross stretchers *b, b.* *c,* is the yarn beam or roller upon which the warp *d, d,* is wound. The warp threads proceed from the yarn beam through the harness or healds *e, e,* which slide horizontally in bearings *f, f,* affixed to the frame *a, a,* on each side.

It will be seen that the cloth, as it is produced by the weaving, proceeds over the breast beam *g,* on to the work or cloth roller *h,* at the top of the loom. The shuttle boards or boxes, are shewn at *i, i,* secured fast to the sides of the frame *a, a,* and are quite free from, and independent of, the moving slay or batten *j, j.* This peculiar arrangement of the parts of the loom, will admit of the batten or slay, being projected upwards, to beat against the weft; and this particular motion is most desirable in manufacturing woollen cloths.

Upon the main driving shaft *k,* the strap pully *l,* is thrown into gear with the driving pinion *m,* by means of the setting-on rod *n*; and the pinion *m,* being geared with the toothed wheel *o,* which is fast upon the cam shaft *p,* the toothed wheels *q, q,* are actuated. The larger of these wheels *q,* is keyed fast upon the tappet shaft *r,* upon which the tappets or cams *s, s, s, s,* are also mounted; thus it will be seen, that as this tappet shaft *r,* revolves, the tappets *s, s,* will successively actuate the treadle levers *t, t, t, t,* and thus divide the warp threads by shedding the healds at proper intervals for the passage of the shuttle *u.* The shuttle is projected across the loom by means of the picking stick *v,* which is suddenly actuated by the spring *w,* causing the roller, upon the end of the short lever *x,* to escape the step or fall cut upon the scroll cam *y,* keyed fast upon the cam shaft *p.*

It will be seen that there is one of these scroll cams at each end of the cam shaft, having the step or fall cut in opposite points of their peripheries, in order to effect the projection of the shuttle from each side of the loom alternately, which will be readily understood by persons conversant with the ordinary evolutions of the loom.

The extreme end of the picking stick *v*, bears against the sliding piece *z*, and exactly at the point opposite the centre line or point of the shuttle, so that the shuttle will thus receive a blow in a direct line through the centre of the warps, instead of being liable to that uncertain course sometimes produced when the slide piece *z*, is attached to the picking stick by a cord. To the other end of the picking stick is attached a link 1, connected to the lever 2, fast upon the upper end of the upright rod 3; which lever 2, is placed in an opposite direction to the lever *x*, fast at the lower end of this rod. By these means the picking stick is suitably actuated by the rotation of the scroll cam *y*.

The sudden rise of the batten or slay *j*, and the necessary sharp blow which is desirable to beat up the cloth, as each weft thread is put in, is effected by the cams 4, 4, which are fast upon the cam shaft, and consequently revolve with it, actuating the lever 5, fast upon the cross shaft 6, and allowing this lever to escape or fall past the strait side of the cam, as will be clearly seen in fig. 1, where the lever 5, is shewn just upon the point of escaping the cam *b*, and is drawn in dotted lines in the same figure as having escaped this point.

By the momentum of the falling weights 7, 7, at the ends of the levers 8, 8, (fast upon the cross shaft 6,) the levers 9, 9, (also made fast upon the shaft,) are made to rise; and as the frames 10, 10, carrying the batten *j*, are attached to the extreme ends of these levers 9, 9, the batten will immediately ascend with a sharp quick stroke, and thus perform the beating up of the cloth.

It will be seen that these frames 10, 10, (as there is one to carry each end of the batten or slay) are provided with adjustable stop pieces or set screws 11, so that the stroke of the batten or degree of impetus may be varied according as the quality of the cloth to be produced may require.

As the batten ascends, all strain upon the warp threads is obviated by means of the india rubber or other elastic bed 12, with which each side of the loom is provided, for the purpose of giving a slight rebound to the batten, as the stops 11, strike against the bed 12, and thus preventing any possibility of breaking the warps in consequence of the sharpness of the blow given by the batten. It will also be perceived that the degree of impetus given to the batten may likewise be adjusted by sliding the weights 7, upon the lever 8, as occasion may require.

As the blow of the batten against the weft thread is quite sufficient to cause the yarn beam to give out the quantity of yarn required, I am enabled to dispense with the usual delivering and taking up motions which are commonly attached to power looms, merely keeping the whole in proper tension by means of the friction band or weighted cord 13, conducted over suitable tension pullies 14, and round the drums at the ends of the warp and work rollers.

In case the shuttle should not enter the shuttle box at every stroke of the picking stick, the notched lever 15, will catch upon the tooth or neb 16, upon the batten as it rises, and thereby raise the lever 17, and by the agency of the rod 18, lift the hand lever 19, off the pin fixed in the side of the setting-on rod *n*, which will cause the spring 20, to throw the driving pulley *l*, out of gear with the pinion *m*, and to stop the loom.

It will be evident that the descending weights, which raise the batten or slay to its work, may be exactly regulated to give any degree of impetus to the stroke of the reed, by being loosely mounted upon levers attached to the cam shaft; which levers may be so graduated as to insure any degree of momentum that it may be desirable to give to beat up any quality of work; and also it will be seen, that by these means the two ends of the reed may at once be brought to bear upon the work equally.

Another great advantage in my improved construction of loom consists in having the shuttle boxes detached from the slay or batten, and fixed or made stationary upon the framing of the loom, so that when the warps are divided, the blow of the picker can instantaneously be given to the shuttle, which is at rest; and as such blow may thus be given in a direct line with the points or centre of the shuttle, the shuttle will be impelled through the warps in a straight undeviating line, instead of being liable to that zig zag course so frequent in common power looms, caused by the direct impetus given to one side of the shuttle, and while it is in a state of constant motion with the vibration of the batten, thus frequently throwing the shuttle out of its direct course, causing it to break through the warps and fly out of the loom.

Having now described my improvements in looms for weaving,—I confess that I am aware of having described some well known parts of mechanism commonly employed for weaving; but this I have done for the sake of illustrating the manner in which I adapt my improvements in looms to those contrivances already known, and therefore I make no claim to any such of the old or known parts of looms independently of my peculiar arrangement and combination. But I claim, as my invention, the novel arrangement, construction, and adaptation of the parts of such apparatus or mechanism in the way I have represented in the drawing annexed, particularly as regards looms for weaving woollen cloths; and especially the adaptation of adjustable and elastic stops for the purpose of determining the blow or extent of stroke of the batten or slay in beating up the work in looms in general; and also the stationary shuttle boxes when fixed to the framework, or constructed, independently of the batten or slay, for the purpose as aforesaid, that a direct and steady impetus may be given to the shuttle.—[*Inrolled in the Rolls Chapel Office, September*, 1838.]

Specification drawn by Messrs. Newton and Berry.

To JOHN HEATHCOAT, *of Tiverton, in the county of Devon, lace manufacturer, for his invention of a new or improved method or methods of manufacturing, producing, forming, or fashioning ornaments, or ornamented work or figures upon, or applicable to, gauze, muslin, and net, and divers kinds of cloth, stuff, or woven textures; and also certain machinery tools, implements, or apparatus, to be used in manufacturing, producing, forming, fashioning, and applying such ornaments, or ornamented work.*—[Sealed May 4th, 1837.]

THE first part of this invention consists in a method or methods of manufacturing, producing, forming, or fashioning ornaments, or ornamental work, or figures, composed of edgings, neiges, tattings, or narrow stripes, of any other suitable fabric, made to assume new forms and shapes by being put upon pins, arranged to receive the same, in curves, angles, circles, or other figures. This will be fully explained by the drawings and description of the machinery hereinafter inserted.

I do not, however, confine myself to that particular system of machinery, but claim the method of forming or fashioning ornamental figures upon, or by means of series of pins, whether the same be arranged on a cylinder or on any flat or curved surface. And I further claim the method of forming ornamental figures from neiges, edgings, tattings, or other fabrics, with indentations, or spaces left at suitable places, contrived for, and intended to facilitate the forming of curves and acute angles or turnings, so as to permit the said edgings or other fabrics to assume the new shapes required without being puckered or distorted.

The indentation required for producing one pattern, and the new form which is given to the edgings in that particular design, by putting them on the pins, as shewn in fig. 11, will sufficiently illustrate the nature of the invention; and it will be evident, that by varying the forms of arrangement of the pins with corresponding or suitable indentations or spaces in the edgings, varieties of figures or patterns may be produced.

The second part of my invention consists in certain machinery tools, implements, or apparatus, to be used in manufacturing, producing, forming, fashioning, and applying such ornaments, ornamental work, or figures.

Plate I., fig. 9, represents the side view or elevation of the machine composed of the large cylinder A, and the small cylinder B, and their accessories, mounted upon a frame C. The rim of the large cylinder is pierced with holes to receive the pins *a*, *a*, which holes are made in curves, or other figures, according to the pattern or design intended to be produced, as will be seen more clearly in the plan, fig. 10. These pins are sustained by a curved plate D, supported from the axis of cylinder A, within or underneath the upper portion of the said cylinder rim A; which plate is so shaped and kept stationary by the brace *e*, as to allow the pins to be pressed back within the perforated cylinder A, as they are successively brought in contact with the small cylinder B, by which means the borders, sprigs, or other figures, are liberated from the pins. As the cylinder revolves, the pins descend by their own weight, whereby the points again project from the cylinder A, and are kept by the curved plate D, in that position, as they move in succession towards the upper part of the circle, as will be best seen detached at fig. 12.

Upon these pins the edgings or other texture (which may be conveniently supplied from the bobbins I, I,) is put, and the revolving of the cylinder A, carries it forward towards the cylinder B, which, on its part, draws off the lace, net, or other fabric, from the roller H, and bears it on the upper part of its surface towards the cylinder A. The surfaces of these two cylinders being moved simultaneously and equally, (by means of the wheels, upon their respective axis, working into each other,) the net and the edging or border are brought together, and pressed closely between them: over the small cylinder the sizing roller E, is made to press upon the net,—the surface of the roller being formed according to the figure which the edging assumes upon the cylinder A.

The cement is applied to the net only where the edging will come upon it when the pressure, just alluded to, causes the edging to adhere to the sized net. The roller E, is supplied with size or cement by a small roller F, the under surface of which dips into the trough containing the same; and as the rollers E, and F, by the wheels upon their respective axis, are connected, and in due proportion with the cylinders A, and B, a proper supply of size is in succession applied to those parts of the net, or other fabric, intended to receive the ornamented border or pattern.

I find it convenient to cover the surface of the roller E, with woollen cloth or other suitable elastic substance which will yield to any inequality of the material passing under it. G, is a cylinder to receive the lace,—it is moved by a band passing over the cylinder B, which causes it to draw the lace therefrom, and to overcome any tendency which it may have to adhere to the said cylinder B. But to prevent the lace from being stretched or elongated, and also the better to separate it from the cylinder, I cause a number of threads of silk to pass over the cylinder B, under the net. These threads effectually strip the net or lace from the cylinder, and continue in contact with it until the whole operation is completed, and are not separated from it until the lace is taken from the cylinder G. Wet spunges *b*, *b*, are made to press against each of the cylinders A, and B, to take off any size which may adhere to them. Motion is given to the cylinder B, (which, by the train of wheels and the band, communicates it to the other cylinders and the roller,) by a treadle acting upon the ratchet wheel, fixed upon its axis, or by any other suitable contrivance. *c*, is a spring which, by its action against the bearing of the cylinder A, regulates the pressure upon the net and border between the two cylinders.

The letters of reference denote the same parts in the several figures.

The trough, which contains the size or cement, is regulated so as to allow a proper quantity to adhere to the surface of the roller F, the excess being retained by the contact or pressure of the side of the trough against it.

I find it useful to pass the net, or other fabric, destined to receive the border, alternately under and over the wires *d*, in order to keep it flat and moderately tight. Tension cords and weights are likewise applied to the bobbin K, and cylinder G, so as to give the required tension to the silk threads and finished work.

For the purpose of better exhibiting the several parts of the apparatus, I have left out the work altogether in the plan, fig. 10.

It may be further useful to add that the wet sponges *b, b,* are advantageously applied to the surfaces of the cylinders A, and B, by the pressure of levers and springs.

I have used the terms edgings and borders:—by the first is intended any suitable stripes of woven or manufactured texture proper for being formed into figures or patterns; and borders are meant to designate such edgings formed into designs and attached to net, muslin, or other suitable texture.

I have, for the sake of more clearly describing the process, shewn an uninterrupted succession of pattern or design, which I call borders; but it is evident, that if alternate intervals or spaces were left between portions of pattern, detached objects of the nature of sprigs, groups, or bouquets, may be produced according to the taste of the designer, and the consequent arrangement of the pins and the roller by which the gum or size is applied to the net.

If the object be to produce imitation of Brussels lace or Honiton sprigs, the edging must be made of such forms and materials as will, when formed and pressed into the proper shapes, most nearly resemble the work made by the hand with bobbins or needles; and the method of sewing them to the net, which is practised with regard to the Brussels and Honiton sprigs, may be adopted; and also in imitation of Chantilly and other blond laces, in case it should be deemed necessary,

The pins (one of which is shewn enlarged, at fig. 13,) are suitable where the edgings have holes or open places by which it can be readily put upon them; but in case the edging is of a close texture the pins must be smaller.

I have used the general denomination of size or cement, which may be made of various kinds of gum or other adhesive matters. I have found gum arabic, dissolved in water and of the consistence of thick cream, to answer;

but I do not claim any particular adhesive matter. I claim, however, as appertaining to this part of my invention, the application of size to the net for the purpose of causing the adhesion of the edging by means of rollers, and the application of the edging to the sized parts of the net by the contact of, or rather the pressure between, the two cylinders.

I also claim the method of forming the figure by the cylinder with projecting pins, and the application of the threads to detach the lace from the cylinder B.—[*Inrolled in the Rolls Chapel Office, November*, 1837.]

To PETER FAIRBAIRN, *of Leeds, in the county of York, machine maker, for an invention of certain improvements in looms for weaving ribbons, tapes, and other fabrics, being a communication.*—[Sealed 22nd June, 1838.]

THIS invention of improvements in looms for weaving ribbons, tapes, and other fabrics, consists in a new arrangement of mechanism suited to the construction and working of a machine for weaving narrow goods by the agency of steam, or other power, applied to a rotary shaft: the leading features of which are; firstly, a peculiar disposition of the headles or harness, and of the batten or lathe, and of the mechanism by which they are actuated; secondly, a method of driving the shuttle by pointed levers, worked by segment racks instead of employing peckers; thirdly, a mode of effecting the taking up of the work, and of regulating that taking up according to the increasing diameter of the work roller; fourthly, the mechanism for knocking off, that is, stopping the evolutions of the loom in the event of the shuttle failing to reach its proper destination; and fifthly, the combination of a series of such looms in one general frame, all of which are independent of each other, though driven by one common shaft, extending through the whole series.

Plate III., fig. 18, is an end view of the loom, taken in geometrical elevation; a part of the frame being removed in order to shew the mechanism which is attached to the inner side of the frame. Fig. 19, is a front elevation of the same, the similar letters of reference pointing out corresponding parts of the machinery.

The warp beam or roller A, is mounted in adjustable arms B, at the upper part of the back of the frame from whence the warp threads proceed through stationary guide pins C, between the dividing rods D, and thence through the headles E, E, and reed F, over the breast beam G, to the work beam or roller H. The warp beam A, and work beam H, are held tight by a friction band I, I, I, which passes over a pulley J, on the axle of the work roller, and also over a pulley on the warp roller A, and under the tension pullies K, K, attached to a weighted lever L, for the purpose of keeping the warp threads at their proper tension.

The main driving shaft, shewn at M, extending through the machine, (indeed through the series of machines,) is mounted in suitable bearings on the lower part of the frame. At the outer end of this shaft, the rigger or driving pulley N, is affixed, by which the shaft is driven, through the agency of a band from the steam engine or other first mover.

Upon this main shaft M, a strap pulley O, is likewise fixed, which carries an endless strap P, communicating with a corresponding pulley Q, fast on the crank shaft R, mounted in bearings in the frame above; and alongside of the fast pulley Q, there is also a loose pulley S, sliding round upon the crank shaft, so that by shifting the endless strap P, sideways on to the fast, or to the loose pulley, the working parts of the loom may be set going or brought to rest; and when going, their movements are regulated by a fly wheel T, fixed on the crank shaft.

The batten or lathe U, holding the reed and the shuttle, and the apparatus for driving it, is affixed to the legs or swords V, which have their bearings or pivots in the frame below. A connecting rod W, attached to the crank on the shaft R, is also attached by a joint to the legs V; hence, as the crank shaft revolves, the batten or lathe is made to vibrate.

On the crank shaft R, there is also affixed a toothed wheel X, which takes into another toothed wheel Y, of twice the diameter of the former, on a shaft Z, below, turning in suitable bearings on brackets, extending from the end frames. Upon this shaft Z, there are likewise certain tappets or cams for working the levers attached to the under parts of the headles or harness, which answer to treadle levers; and there are also other cams for moving two lower levers, which are connected to the mechanism that actuates the shuttle.

Having now pointed out the general construction of the loom, I proceed to describe the manner in which it affects the operation of weaving, and the minor parts of the mechanism by which its evolutions are performed.

The warp threads being distended, as said, and the driving power applied to the shaft M, through the rigger or driving pulley N, the first thing to be done, in order to set the loom at work, is to raise the perpendicular rod *a*, by drawing up its handle, in front of the machine, into the position shewn in fig. 18, where it will be seen that a spring, acting against the rod, will press it back, and cause a notch, at the hinder part of the rod, to take hold on a horizontal catch bar *b*, which will hold up the rod, and thereby keep the works going until they may be required to be stopped.

The lower end of this upright rod *a*, is attached by a joint to a lever *c*, affixed on the end of a horizontal shaft *d*, mounted in brackets on the further side frame. The reverse end of this shaft *d*, carries an arm *e*, connected by a joint to the strap guider *f*; hence by drawing up the perpendicular rod *a*, the strap guider will be made to turn upon its fulcrum pin, and to shift the driving strap P, from the loose to the fast pulley Q, and consequently to give rotary motion to the crank shaft R, and from thence through the wheels X, and Y, to the tappet shaft Z.

These two shafts R, and Z, being thus made to revolve, the crank will work the connecting rod W, and thereby give the required vibratory action to the batten or lathe U; at the same time the rotation of the tappets on the shaft Z, will lift the levers *g*, *g*, alternately, and by that means cause one of the headles or harness E, to rise, whilst the other headle descends, opening the sheds of the warp, for the purposes of allowing the free passage of the shuttle between them.

The means by which the headles are worked, and the batten or lathe made to vibrate, being now understood,—I proceed to describe the mechanism employed for driving the shuttle to and fro in the lathe. To assist this description, the lathe is shewn detached from the machine at fig. 3, which represents its front side. U, is the lathe; V, V, its legs; and F, the reed, as in the former figures. The shuttle *h*, is moved to and fro in the race or groove *i*, *i*, of the lathe by means of the pointed ends of two levers *k*, *k*; which points, alternately, take into holes, shewn by dots, in the shuttle; and as the levers *k*, *k*, slide to and fro, carry the shuttle through the sheds of warp.

The movements of these pointed levers are derived from the rotary cams on the shaft z, (see fig. 1,) which cams act upon the levers *l, l,* connected to the bent rods *m, m.* The upper ends of these bent rods *m,* are attached to arms, extending from a segment rack *n,* (see fig. 3,) which segment rack *n,* turns upon a centre pin in a bar affixed to the upper parts of the legs of the lathe; consequently, as the levers *l, l,* are moved up and down by the rotary cams, the bent rods *m,* will be moved up and down also, and give vibratory actions to the segment rack *n.*

The teeth of this segment rack *n,* take into another segment rack *o,* affixed to the upper part of a forked lever *p,* mounted on a fulcrum pin in a bar attached to the legs of the lathe below; hence, as the rack *n,* vibrates, the rack *o,* and the forked lever *p,* will be made to vibrate likewise.

The forked lever *p,* carries upon a stud fixed near the middle of its length, a rocking lever *q, q,* which rocking lever supports, on pivot joints, the lower ends of the pointed levers *k, k.*

In the under part of each fork of the lever *p,* there is a notch *r*; which notches, respectively, as the forked lever *p,* vibrates, take hold of a square stud *s,* fixed in the back of each of the levers *k.* By these means the movements of the forked lever *p,* cause the pointed ends of the levers *k,* to pass to and fro with a sliding movement in front of the shuttle race, for the purpose of drawing the shuttle through the sheds of warp; and in order to guide the points of the levers *k,* at the proper times, into and out of the holes in the shuttle, recesses or curved grooves *t, t,* are formed in the front of the batten or lathe, to receive the studs or antifriction rollers *u, u,* which are attached to the backs of the pointed levers *k.*

It will now be perceived, that as the levers *k,* are carried to and fro, the studs acting in the curved grooves *t, t,* will cause the point of each lever to rise on the approach of the shuttle for the purpose of entering, and take hold of the shuttle, and to descend again and quit the shuttle when the point of the lever has performed its duty.

It is only necessary to add, that a plate must be placed over that part of the face of the lathe or batten in which the grooves *t, t,* are formed, for the purpose of confining the movements of the levers *k,* that is, keeping them close against the face of the lathe. This plate is removed in fig. 3, in order to shew the grooves; but in fig. 2, it is seen in its place, at *v, v.*

The first and second heads of the invention having been now fully explained, as well as the manner in which this improved machinery performs the operation of weaving, I proceed to describe the apparatus by which the taking up of the work is effected and regulated, according to the quantity accumulated upon the work beam.

To the leg v, of the lathe, a connecting rod *w*, is attached, by a pin passing through a long slit in the rod, (see fig. 1,) which allows the rod to slide lengthways as the lathe vibrates. The reverse end of the rod *w,* is attached to the arm *x,* of a three-armed lever *x, y, z,* mounted upon a stud (a,) fixed in the frame of the machine at the right-hand side of fig. 2. Upon this stud, a ratchet wheel (b,) having very fine teeth, turns loosely; and the end of a click or catch (c,) connected to the arm *y,* of the three-armed lever, takes into the ratched teeth. As the lathe vibrates, the connecting rod *w,* will cause a small rotary movement to be given to the three-armed lever, and at every stroke of the lathe cause the click (c,) to drive the ratchet wheel onward.

A pinion, affixed to the side of the ratchet wheel (b,) shewn by dots, takes into a toothed wheel (d,) turning loosely on another stud below; and a pinion (e,) on the side of the wheel (d,) takes into a toothed wheel (f,) fixed on the shaft of the work roller H. Thus, by the occasional movement of the ratchet wheel (b,) driven by the vibratory actions of the lathe, the train of wheels and pinions will be made to turn slowly, and the work roller H, to take up or wind on the work as it comes down from the breast beam.

As, however, the amount of the taking-up motion of the roller H, upon which the work is wound, is required to be diminished, in proportion to its increasing diameter, that object is effected through the agency of a friction roller (g,) mounted at the end of a lever (h,) turning on a fulcrum pin at (i,) the roller (g,) being made to bear against the periphery of the work roller by the force of a weight appended to the lever. The reverse end of this lever (h,) is connected to a perpendicular sliding rod (k,) having a small arm (l,) extending from its upper end, on which the arm *y*, of the three-armed lever bears; consequently, as the diameter of the work roller H, becomes enlarged, the roller (g,) will become depressed, and the reverse end of its lever (h,) be made to raise the perpendicular rod (k,) with its arm (l,) and thereby to contract the extent of rotary action of the three-armed lever, and cause the driving click (c,) to move the ratchet wheel (b,) a smaller portion of a rotation at every stroke of the lathe.

I now proceed to shew the manner in which the knocking off, or stopping the evolutions of the loom, is effected.

It has been before said, that, in order to keep the machinery going, the perpendicular rod (a,) must be held up by the catch-bar *b*. This catch-bar is mounted on two perpendicular rocking levers (m, m,) the pivots of which are below, fixed in the side frame.

As the three-armed lever is made to vibrate, through the agency of the lathe or batten, as before described, a tooth, on the arm *z*, is brought against a projection on the inner side of a bent lever (n,) which pushes back that lever, and also the catch-bar (b,) with the rocking levers connected to it. But this movement is not intended to be sufficient to withdraw the end of the catch-bar (b,) completely from the rod *a*, but only to prepare it, in order that the rod *a*, might be readily released, in case of the shuttle, by accident, stopping between the sheds of the warp.

On the plate, in front of the loom, immediately over the breast beam G, a pronged lever (o,) is mounted upon an axle (p). The end of the prongs of this lever are bent downwards, as shewn in fig. 1; and the tail of the lever has a nib (q,) which is in contact with a tooth (r,) upon a small shaft (s,) extending across the front of the machine. This tooth (r,) is kept against the nib or tail of the lever by a weighted cord (t,) attached to a pulley, fixed on the shaft (s,) and another tooth (u,) fixed on the same shaft, acts against the butt end of the lever (n).

Now, in the event of the shuttle (h,) stopping short of its destination in the groove or race *i*, *i*, the edge of the shuttle will, by the beating up of the lathe, be made to strike against one of the bent prongs of the lever (o,) which will lift the pronged lever, and in so doing depress the nib (q,) and force back the tooth (r,) fixed on the small shaft (s.) The rotary movement thus given to the shaft (s,) will cause the tooth (u,) to force back the lever (n,) and in so doing to draw the end of the catch-bar *b*, from supporting the rod *a*, when the rod *a*, will instantly descend, and by turning the shaft *d*, move the strap guider *f*, and throw the driving strap from the fast to the loose pulley, by which means the evolutions of the loom will be suspended.

The last feature of the improvement is, associating a series of these narrow looms in one general frame, side by side; in which the side frame of one loom is made the side frame of the next loom adjoining it, the whole being driven by one shaft II, extending through the series; but each loom being independent of its neighbour, and actuated by its own particular mechanism, and driving strap, as above described.

Lastly, I desire it to be understood, that though I have shewn in the figures of the accompanying drawing many parts of machinery and apparatus which are common to other looms, yet I do not intend to claim the same as forming any parts of these improvements, except the particular way in which they are arranged and adapted, as described; but the improvements which I do specifically claim as new, and which are secured to me by the above recited letters patent, are those set out under the five several heads, at the commencement of this my specification, and the details of which are fully described by the drawings and subsequent explanations thereof.—[*Inrolled in the Rolls Chapel Office, April,* 1839.]

Specification drawn by Messrs. Newton and Berry.

To ANDREW SMITH, *of Princes-street, Leicester-square, in the county of Middlesex, Engineer, for certain improvements in apparatus for heating fluids and generating steam.*—[Sealed 20th December, 1838.]

THIS invention of improvements in apparatus for heating fluids and generating steam, consists in a peculiar arrangement of tubes or pipes to be used as a continuous water chamber. These tubes or pipes are surrounded on all sides by a bath of fused metal, which, by communicating heat to the water in the tubes, converts that water into steam.

Plate II., fig. 5, represents a section, and fig. 6, a plan view of this apparatus. *a, a, a,* are the pipes or tubes forming the water chamber, and surrounded by a metallic bath *b, b, b.* The pipes or tubes *a, a, a,* are supported by rods or plates *c, c, c,* which are merely placed between each row of tubes, and not attached to the sides of the apparatus.

It may be as well here to observe, that the tubes or pipes *a, a, a,* are allowed to lie on the supporting rods *c, c, c,* perfectly free and unattached to any part of the apparatus; because, if they were fixed in an immovable position, the expansion and contraction, to which they are subjected, would be liable to destroy the joints.

Steam chambers *d, d, d,* are placed above the water tubes, in communication with them, which are supplied with steam by means of the short pipe *e,* shewn by dots in fig. 5. It will be seen, that the water chambers gradually increase in size, beginning at the left-hand end of the lower row of tubes, that being the place where the water is supplied, until they arrive at the same end of the upper row.

I sometimes construct the apparatus with three rows of water tubes or pipes; and in that case make the lower row, or that at which the water is supplied, all of the same diameter; and the next row above a size larger; and the row above that larger still; so that, instead of each separate tube being of an increased diameter, I increase the size of the whole row.

I wish it to be understood, that I do not confine myself to any precise number of tubes, or rows of tubes, to be used as water chambers, as it is evident that the number may be varied according to circumstances. And I do not claim the heating of fluids, or converting water into steam, by means of a metallic bath, as that has been done before; but I do claim, as my invention, the peculiar arrangement of tubes or pipes, as a continuous water chamber herein set forth and described; such pipes or tubes increasing in diameter, separately or in rows, or in series, as they approach the steam chambers.—[*Inrolled in the Rolls Chapel Office, June,* 1839.]

Specification drawn by Messrs. Newton and Berry.

To JAMES JONES, *of Salford, in the parish of Manchester and county of Lancaster, machine maker, for his invention of certain improvements for making rovings, spinning, and doubling, of cotton, silk, flax, and other fibrous substances.* [Sealed 20th October, 1834.]

THE Patentee states, that his invention consists in certain arrangements of apparatus or machinery by which the differential motions between the bobbin and flyer, or between the flyer and spindle, in spinning, doubling, and roving machines, is rendered more uniform, and easily adjustable, than in the ordinary constructions of machinery employed for those purposes.

This proposition is illustrated by fig. 7, Plate II., which represents an elevation of the spindle of a throstle or doubling machine, with its appendages. *a, a,* is the spindle, driven by a band from the drum *b,* passed round a warve or pulley *c.* Upon the spindle is placed a loose tube *d,* which is connected to the flyers *e, e,* by a small nib and slit. This tube is driven at a different speed to that of the spindle, by a band from the drum *b,* passed round the larger warve *f*; these two bands may, however, be one continuous band passed twice round the drum.

To the flyers is attached a tin cylindrical case or hoop *g,* which not only keeps them steady, but prevents their expanding when driven at very great speed.

The bobbin *h*, is placed upon the top part of the spindle and revolves with it; but as the bobbin is loose and only bears upon a small shoulder on the spindle, it is easily drawn round by any extraordinary tension of the thread.

The threads, as they come down, are, by the rotation of the flyers, twisted, spun, or doubled; and by the difference of the speeds of the spindle carrying the bobbin and that of the flyer, the thread is caused to wind itself round the barrel of the bobbin *h*; and by the ordinary movement of the copping rail, the threads are wound on the bobbin in helical coiles up and down its barrel.

Several other modifications of the invention are proposed; as the employment of a sheath or quill in place of the bobbin, in order to build (as it is called) a cop upon it—also, the adaptation of an inverted flyer, carried by the spindle; none of which appear to us to present the slightest novelty as regards throstle spinning.

The spindle with the bobbin being driven at one certain speed, and the flyer at another certain speed, dependent upon the respective diameters of their warves, the bobbin is made to take up or wind on at all times a uniform length of thread; but, as the accumulation of the coiled thread upon the bobbin increases its diameter, the winding-on surface necessarily increases also. In order, therefore, to accommodate this difference, and that the threads shall be wound upon the bobbin at all times with a uniform tension, the bobbin is allowed to slip upon the spindle and be partially drawn round, so as to relieve the extra tension as above said.

The patentee says in conclusion, that he claims as his invention "the arrangement and construction of spindles with their appendages for spinning, doubling, and roving machines, in which the difference of speed, between the flyer and bobbin, is effected by the different sizes of the warves by which they are driven, in conjunction with the drag for allowing that difference to vary as the bobbin fills; together with the continuous band for driving both."—[*Inrolled in the Inrolment Office, April*, 1835.]

To Ovid Topham, *of Whitecross-street, in the parish of St. Luke, in the county of Middlesex, engineer and mill-wright, for his invention in certain improvements in the construction of sluice cocks for water works, and which improved construction of cocks is also applicable to steam, gas, and other purposes.*—[Sealed 5th October, 1837.]

This invention applies more particularly to that description of sluice cocks or valves which are usually placed under ground in the street mains, or service pipes of water and gas works, in which situation the metal, composing the same, is liable to injury by corrosion, or the chemical action of different earthly matters in contact therewith: but which effect is more particularly injurious as regards the wrought iron screw bolts and nuts, and metallic packing used in securing the various junctions of the parts composing the casing or body of the said sluice cocks or valves, in consequence of which, frequent leakage takes place. The object of my invention is to obviate such evil, by making or manufacturing such sluice cocks and valves, without the usual side or vertical joints or junctions, by which means, their necessary screw bolts, nuts, and metallic packing are dispensed with; and consists in forming or casting the main body or casing of such sluice cocks or valves, in one continuous piece of metal, having only one opening or aperture at the upper part, for the convenience of fitting up and applying the slide of the valve: which aperture is afterwards closed with the necessary cap-piece or cover fitted in the usual manner, through which the shaft or spindle, connected with the screw rack and pinion, or other mechanical contrivance used for raising or lowering the slide of the cock or valve, is passed; and as such cap-piece is not usually covered with earth, its joints, or junctions, and packings, are not so liable to injury as those at the side of the ordinary sluice cocks.

In order further to illustrate my improvements, and the manner of carrying the same into effect, I will now refer to the accompanying drawings, which are several representations of my improved constructions of sluice cocks or valves, shewing several modifications or arrangements of the same; with different modes or contrivances for raising and lowering the slide or stop-piece; but which contrivances I do not consider as part of my invention, they being in common use; and I have only shewn them in order that the mode of applying and using the same with my improved sluice cocks or valves, may be readily understood.

Plate III., fig. 1, is a side elevation of one of my improved sluice cocks or valves, detached from the street main or service pipe; fig. 2, is a vertical section of the same; fig. 3, is a plan or horizontal view, the cap-piece or cover being removed to expose the interior; and figs. 4, and 5, are back and face representations of the slide or stop-piece, removed from out of the valve to shew its construction; the same letters of reference being marked upon these and all the following figures. *a, a,* is the main body or casing of the valve, cast in one piece with the two ends or sockets *b, c,* for receiving the ends of the street pipes or mains, together with the upper part or chamber *d,* in which the mechanical contrivance for raising and lowering the slide is placed, which, in this instance, is a toothed rack and endless screw; *e,* is the cap-piece or cover of the chamber *d,* fitted in the usual way with screw bolts and nuts, and metallic packing; and the stuffing box *f*, through which the spindle or shaft *g*, is passed, its lower end turning in a proper bearing, and having the endless worm or screw *h*, formed upon it, which takes into the toothed rack *k*, formed upon the back of the slide *i*, which is accurately fitted at the parts *m*, *m*, to the face of the aperture *n*, of the valve or cock. The slide is kept tight against the face of the aperture when closed, by means of inclined planes or wedge pieces at *o*, *o*, formed on the casing coming in contact with other parts *p*, *p*, of the slide. The action of this valve will be readily understood by inspecting the drawings; therefore no further description will be necessary.

Fig. 6, is a longitudinal vertical section of another sluice cock or valve of my improved construction, shewing a slight variation in the mode of applying and fitting the slide thereto, and in the manner of making the same, which in this instance has double faces fitted against the mouths of the apertures, and is worked by means of a male screw formed upon the shaft, taking into a female screw upon the slide—and fig. 7, is a plan view of the same; similar letters of reference being marked upon corresponding parts as in the former figures, and the construction of this valve being so simple, it will not be necessary for me further to describe it; the slide being in this instance fitted between two surfaces or faces formed on the mouths of the apertures *n*, *n*, of the valve or cock. Figs. 8, and 9, are front and back views of the slide and screw.

Fig. 10, is a side elevation; fig. 11, is a longitudinal vertical section; and fig. 12, is a plan view of another of my improved valves or cocks, in which another slight variation in the fitting up and applying the slide is shewn, the face of which, in this instance, is fitted against the face of the aperture *n*, of the end piece or socket *c*, which in this modification is cast separate from the valve, case, or box, and secured by a screw-joint and packing or other fastening to the valve case. This mode may be preferred by some persons for the convenience of accurately forming the face of the aperture, or the convenience of putting brass faces thereon, which can easily be done when it is detached from the valve; whereas, in the former instances, the faces of the apertures have to be accurately formed by means of tools introduced into the valve case through the chamber *d*. Figs. 13, are various detached representations of the slide, the better to shew its construction. Fig. 14, is a side elevation; fig. 15, is a vertical section; and fig. 16, is a plan view of another modification of my improved construction of slide-valve or cock, shewing the slide fitted with double facings in contact with the mouths of the two ends or sockets *b*, and *c*, which, in this instance, are both moveable for the purpose as above stated; in other respects, the construction is the same as that last described. Figs. 17, are side and face representations of the slide and its shaft or spindle, detached from the valve, to shew the manner of fitting up the same.

Having now described my improvements in the construction of sluice cocks or valves, and the manner of carrying the same into effect, I would remark, that it will be evident, that the same is applicable to steam pipes, brewers' and distillers' liquor pipes, and various other situations, where it is desirable to obviate the evil arising from leakage of the side joints of sluice cocks or valves of the ordinary construction; and in conclusion, to state, that I do not claim any of the mechanical contrivances herein described and shewn for raising and lowering the slides of the said cocks or valves, or the mode of fitting or applying the same with the necessary shafts or spindles and stuffing boxes, as they are not new, and form no part of my invention; my improvements consisting in, and what I claim as my improvements being, the making, forming, or casting the main body box, or casing of the slide-valve, or cock, in one and the same piece of metal; and the modes of fitting and applying the slide or stop-piece thereto, and the manner of forming the facings of the cocks or valves as herein set forth and described.—[*Inrolled in the Rolls Chapel Office, April,* 1838.]

To Robert Whiteside, *of Air, in the county of Air, North Britain, wine merchant, for his invention of certain improvements in the wheels of steam carriages, and in the machinery for propelling the same; which is also applicable to other purposes.*—[Sealed 20th November, 1834.]

There are two objects proposed under this patent; the first is, a mode of giving elasticity to the running wheels of a steam carriage; the second, a mode of lubricating the working parts of a rotary steam engine.

Wheels having elastic spokes, have been several times proposed under different patents from a mistaken notion that the axle being by the pressure and momentum of the carriage allowed to be thrown forward out of the centre, such position obtained through the elasticity would assist in impelling the carriage forward. Without considering the absurdity of the proposition, the present patentee has merely attempted to remove what he considers some practical defects in the construction, and in lieu of elastic spokes, proposes that the axle of the carriage shall be inserted into the centre of a square plate, which plate is allowed to slide in two directions, much in the way of the chuck of an eccentric lathe upon a frame attached to the felloe of the wheel: its central position being at all times induced by four powerful helical springs, extending from the axle to the corners of the frame. We presume it is unnecessary to give a figure of this complicated and useless apparatus.

The mode of lubricating the working parts of a rotary steam engine, is by placing a reservoir of tallow or other anti-attritious material above the engine, and forming communications therefrom to the interior of the engine: steam from the boiler being allowed to press upon the upper surface of the tallow, in order to keep it in a liquid state, and to force it down the tubes to the pistons or wings working within the steam chamber. The oily matter, having performed its office within the engine, is conducted away and forced up again into the reservoir by suitable pumps.

The patentee says, that he has not thought it necessary to shew the means of working the slides or other parts of the engine, as they constitute no part of his invention; and that he is aware, an apparatus on a similar principle has been before applied to reciprocating engines; he therefore claims only under this part of his patent, the application of the following particulars to rotary steam engines;—the reservoir of fluid kept under suitable pressure with the pipes and other apparatus to convey it to the proper parts, and the pump to return it to the reservoir.—[*Inrolled in the Inrolment Office, May*, 1835.]

Original Communication.

ON CHRONOLOGY.

(To the Editor of the London Journal amd Repertory of Arts, &c.)

Sir,—Having been favoured in several of your former Journals with the insertion of some of my lucubrations, on subjects connected with the arts, sciences, and history, I presume, further, to present, for your approval, the first of a short series of papers on Chronology.

The advantages attending a proper study of Chronology, are, in my opinion, highly important, by fixing, permanently, on the recollection the periods of time at which coeval events have happened. In this, my first letter, I will endeavour to give an idea of the plan I mean to pursue.

The mind is given us that we should improve it, and we read in order to store the mind with facts connected with the histories and actions of those men who have lived before us; it ought then to be our study to fix permanently on the memory, some of the great events that have happened in this world.

We find ourselves inhabitants of this earth, a planet, one of the mighty worlds that are for ever rolling along through infinite space. We can have no means of knowing what beings inhabit, or what laws govern, those glorious orbs that on all sides surround us; we can have no communication with them, nor with the beings that people them. This world is ours, and the enquiring mind should be anxious to know who lived before we had an existence upon it, and what events, what changes, what revolutions it has been subject to. It is only by reading, by searching the records of the past, that we can arrive at that knowledge. But if we can but partially obtain some accounts of the past, it is our duty not to keep them locked up in our minds, for our own gratification, but to bring them forth occasionally, for the improvement of others.

I am confident, that many, I was about to say that the generality of readers, lose one half of the gratification they would derive from reading, for want of first fixing on their minds the dates and periods of time in which those events happened. In order to illustrate this assertion, I would remark, that the traveller, who visits different countries, to enjoy the romantic scenery through which he travels, would experience but little pleasure, it would be very limited, if when he had ascended to the top of a mountain, he stood still, and kept his eyes only on one object; but he looks around him, he views the distant hills, the rocks, the mountain streams, as they thunder down through their deep worn rocky channels into the valleys below. His eye wanders over the verdant fields, the villages, the distant towns, and buildings, that on all sides are scattered around him; he takes them all in at a view, and enjoys the varied picture with delight.

If the traveller proceeded along one line of road, or the reader one series of historical events, keeping his mind's eye only fixed on one object, one event, at a time,—he must lose the interest he would feel on those other objects and events that are around him.

For instance, I will suppose the reader of the bible (and I shall take this book as my great line of road in my rambles along the records of time) keeps his attention fixed only on the great events it narrates, without looking to the right, or left, or what is passing in the world beside,—if he keeps his mind only occupied with the bible heroes, and bible events, as though no other beings existed in the world except Moses and his heroes, Joshua, Jeptha, David, &c. &c. &c., as though no other kingdoms than Egypt and Palestine, no other people than the Egyptians and Israelites, were in existence,—he would lose the interest he might enjoy, if he looked around upon the world, and connected with Pharoah, Moses, and other great men of the scriptures, the men who then flourished in other parts of the earth. The histories of kingdoms and empires, that were rising and falling around him, as he proceeded on his way:—one great event would serve to bring another to his recollection, for the mind like the eye is capable of taking in at one view, many objects, and remembering them.

I will only mention one or two instances, to convey my meaning, and the pleasure to be derived by associating together coeval events. I would remark that, while we are reading of the departure of the Israelites from Egypt, the Exode of Moses,—we should connect with it the departure at that time, of Cecrops, who led out a colony of Egyptians, and founded the City of Athens,—while we are reading the history of Jeptha, and shuddering at the rash vow he made, that in the same year that he defeated the children of Ammon, and offered his daughter as a sacrifice, that other events besides this, were passing in the world,—we should associate with it another matter of history as interesting to the reflective mind, viz: that it was in the same year Troy was taken, and the victorious fleets and armies of Greece, left the shores of Illium.

I need not bring forward more examples to convey to the mind what I mean by the association of events. If then, as we read the history of the chosen people of God, as recorded in the bible, we look on the surrounding nations, the imagination will be more expanded, more interested, more improved, inasmuch as it will exhibit to the mind's eye the various changes that were taking place among the surrounding nations, caused by ambition, tyranny, or the follies of men.

I shall in these letters divide time into circles of centuries, and in order to fix contemporary events on the mind, suppose the spectator standing in the centre of this circle of 100 years, and looking round him upon the world to observe what changes, what events, what men, are the instruments employed to effect those changes. Ten of those circles or periods of time will constitute a thousand years:—now suppose the student only fixes five great events on his mind, in each century, (which I should conceive a very easy task)—in a thousand years he has but fifty great events, eras, or changes, to remember;—and one great event, such as the Exode, the Foundation of Rome, the Battle of Actium, the Building of the Temple, the Death of Christ, the Destruction of Jerusalem,—will always serve to bring others to his recollection, and convey to his imagination an idea somewhere about the time at which it happened. Besides, it will increase his pleasure, and add a more extensive fund of information and knowledge.

I shall then, in my next letter, commence with the earliest chronological records extant; but I shall pass quickly over those long disputed periods of time, as divided by the Chinese, Japan, and Indian records. They may be fabulous, but they are inserted in the records of these nations; and it may not be uninteresting to some of your readers if I quote a few of them,—some of the monarchs, and conquerors, and dynasties, that arose and fell in those dark ages,—periods recorded by these people thousands of years before our computation of time began. I shall quote them, merely as matters of curiosity,—perhaps they are imaginary records, invented by these nations; perhaps they are erroneous divisions of time, but still they are the records of those nations (if they are erroneous,) and worthy our consideration.

I shall also mention some of the different dynasties which rose upon the stream of time, and fell, and were for ever swept away from the earth, with the names of some of the tyrants, and conquerors, of that early period,—who changed the fate of nations, and, throwing upon their shoulders the mantle of royalty, with despotic sway, ruled, uncontrolled, over extensive empires and kingdoms of the earth, thousands and tens of thousands of years before the Mosaic account of the creation of the world, according to the Indian and Chinese records. But, in quoting these records, I do it only as a matter of curiosity, in order to convey to the reflective mind a faint idea of the fabulous histories of those ages long past away, with their kings, their conquerors, and their glory, as recorded by their historians,—and supposed by many superficial readers, and men who think but little, men of limited minds, as well as by many learned philosophers, that these historical records have originated in that pride, all nations feel, to carry back their origin into the darkness of antiquity;—or that these records proceeded from the high imaginings of those master spirits who wrote them;—men that lived in those ages of fable and imagination, and whose pride it was to leave the early history of their native land to future generations,—its glory, its arts, its changes, its high antiquity, enveloped in the darkest clouds of Erebus and night. I will give you two examples, that you may understand what I mean by dividing time into circles of 100 years, in order to fix those events on the mind that happened in that circle, as contemporary;—for instance, I will take that early period from 1100 to 1000 years before Christ, and mention a few of the important events worth fixing on the mind:—

Years before Christ.

1095. Codrus, King of Athens, devotes himself to death for his country.

1089. David is born, the seventh and youngest son of Jesse.

1079. Saul, the son of a shepherd, is anointed king of Israel.

1079. This year died the emperor of China, Tcling-ouang, and the great and good Chao-kong succeeded him.

1060. Saul consults the witch of Endor, who calls up Samuel, who predicts the fate of the approaching battle with the Philistines, and the death of Saul.

1045. Alba Silvius reigns in Latium.

1037. War between Huning, king of Sweden, and Hading, king of Denmark, to revenge the death of his brother.

1031. Homer, the immortal author of the Iliad, born.

1030. David causes a census to be made of the number of men in his kingdom capable of bearing arms, which amounted to thirteen hundred thousand.

1015. The fifth epoque of the history of the Hebrews, their age of glory; Solomon, seated on the throne of David, lays the foundation of the temple at Jerusalem.

1008. The commencement of the twenty-second dynasty of the kings of Egypt, the founder of which was Sesac, who reigned thirty-four years.

1002. Great revolution in China,—the emperor Ichao-ouang is drowned in passing a bridge of boats, and his son, Mou-ouang, succeeded him.

In this century I have named only twelve important events;—then let the reader only remember three or four of them, if he cannot fix them all on his memory. I will now take another period of 100 years:—

Years before Christ.

800. Numitor, king of Latium, is dethroned by his brother Amulius, who, after killing Lausus, son of Numitor, usurps the throne, forces Rhea Sylvia, his wife, who was afterwards the mother of Romulus and Remus, to become a priestess of Juno;—he reigned forty-four years.

790. Isaiah, the prophet, flourished; predicts the birth of the

Messiah; the ruin of Tyre, of Babylon; and the fate of Jerusalem.

786. The twenty-fourth dynasty of Egypt.

785. The voluptuous Sardanapalus reigns fifteen years in Nineveh.

776. The first Olympiad; the celebrated games of Greece, and their division of time,—Coroebus the first victor.

771. Birth of Romulus and Remus, the illegitimate offspring of Rhea Sylvia, the daughter of Numitor, and priestess of Juno.

758. Syracuse built by Archias.

759. Pekah, the son of Remaliah, reigns over Israel, in Samaria,—is defeated by Tiglath Pilesar, king of Assyria, who carries away captive the people of Judea.

753. The foundation of Rome:—Romulus the first king, who reigned thirty-seven years.

747. Era of Nabonassar or Nebuchodonosor, king of Babylon.

739. Badhemah Rajah, of Bengal, is killed by Birbah, his vizier;—this commenced the third dynasty, the second having continued 500 years and 5 months.

735. Candaule reigns seventeen years in Lydia.

726. Hosea reigns nine years over Israel, in Samaria.

722. China is divided into twenty-one kingdoms or principalities.

718. Candaule, the last king of Lydia, of the race of Hercules, is killed by Gyges, one of his officers. Candaule insisted that his beautiful wife should exhibit herself naked before Gyges, who killed him and married the widow.

716. Romulus, after reigning thirty-seven years, is killed by the senators, and reported by them as taken up among the gods.

711. Senacherib invades Israel under the reign of Hezekiah,—his army is destroyed by an Angel,—he returns to Nineveh, and is killed by Adrammelech and Sharezer, his sons.

705. A colony from Corinth settle in Corfu.

I have, in this circle, brought forward more events of time, as illustrative of the advantage of associating them together, and fixing on the mind the great changes that have taken place in the empires and kingdoms of the world.

I am, Mr. Editor, your obedient servant,

BENJAMIN COOK.

Birmingham, August 18, 1839.

Scientific Adjudication.

ROLLS COURT.

KAY *v.* MARSHALL.

INFRINGEMENT OF PATENT FOR SPINNING FLAX.

(For Report of the Specification, see Vol. XIV. of our First Series, p 88.)

This cause has been several times before the Courts,—the last report of which we gave in Vol. IX. of our *Conjoined Series.* At the conclusion of the hearing before the Master of the Rolls, it was then determined to bring a question before the judges of the Court of Common Pleas, as to the validity of the patent in point of law; which was done, and the following was the opinion by them delivered 8th May, 1839.

Certificate of opinion of the judges of the Common Pleas on a special case sent to that Court by Lord Langdale as Master of the Rolls, the question being whether the plaintiff's patent be valid in point of law. The case was argued before Lord C. J. Tindal and Justices Vaughan, Bosanquet, and Erskine, in Hilary Term 1839, by Sir F. Pollock for the plaintiff, and Sir W. W. Follett for the defendants, and the certificate was given in the Easter Term following.

"In this case, which has been sent to this Court by his honour the Master of the Rolls, the question as to the validity of the patent has been argued before us upon various grounds of objection; and consequently, a certificate in the general terms of the question, "*that the patent does not appear to us to be valid in point of law*," could not give satisfaction to the Court from which the question was sent.

"We therefore proceed shortly to state the ground upon which our opinion is formed, that the patent in question is not valid in point of law.

"The patent is taken out for a 'new and improved machinery for preparing and spinning flax, hemp, and other fibrous substances by power,' and the invention is declared in the specification to consist of 'new machinery for macerating flax, and other similar fibrous substances, previous to drawing and spinning it, which is called the preparing it, and also for improved machinery for spinning the same after having been so prepared.'

"Now, although the first part of the invention described in the patent, viz. the new machinery for macerating, appears from the facts stated in the case to be a proper subject for a patent, both with regard to the invention thereof being original, and in all other respects, yet the latter part of the patent, viz. the improved machinery for spinning flax, &c. DOES NOT, upon the facts stated in the case, and the description of the invention contained in the specification, appear to us to be a subject upon which a patent can by law be taken out.

"The patentee, in describing the improved machinery for spinning, which constitutes one part of his patent, informs the public 'that he places the drawing rollers only 2½ inches from the retaining rollers, and that this constitutes the principal improvement in the said spinning machinery,' and he then proceeds to assign the reason and principle upon which the alleged improvement rests; and in a latter part of his specification, (when stating the extent of what he claims as his own invention in respect of improved machinery for spinning flax) he describes it to be the wooden or other trough for holding the roving when taken from the macerating vessels, and 'the placing of the retaining rollers nearer to each other than they have ever before been placed, say within 2½ inches of each other, for the purpose aforesaid.' So that looking at the whole of the specification, it is not the use of the wooden or other trough, as used by him, upon which he relies, as indeed it obviously could not be as an important invention, nor as the proper subject for a patent; but it is 'the placing and retaining of the respective rollers within 2½ inches from each other' that forms the real subject matter of the patent for the improved machinery.

Now, whether a Patent can by Law be taken out for placing the retaining rollers and the drawing rollers of a spinning machine (which machine itself was known and in use before) within two inches and a half of each other, under the circumstances stated in the Case, is the real question between the parties, and we think it cannot.

"For it appears from the endorsement upon the postea, that before the granting of this patent, flax and other fibrous substances were spun with machines by which the *reach* was varied according to the staple or fibre of the article to be spun, and that that had been a fundamental principle of *dry* spinning known and used before the granting of this Patent; and further, that the *reach* used in cotton spinning had been less than two inches and a half. The application, therefore, of a *reach* of two inches and a half to the spinning of flax when in a state of maceration, by which the fibre of flax will not hold together beyond two inches and a half, does not appear to us to be any new invention or discovery, but is merely the application of a piece of machinery already known and in use to the new macerated state of the flax. The fundamental principle in dry spinning was, that the *reach* varied according to the lengh of the staple or fibre of the article to be spun; and spinning machines were in use, either with the reaches fixed or connected with slides, so that their distance might be varied according to the length of the fibre of the article intended to be spun; and, consequently, there is nothing new in applying the use of a spinning machine with a reach of such a degree of shortness as would suit the continuity of the roving of the flax after it is macerated.

"It is to be remarked, that the application of moisture in spinning flax, for the purpose of separating the fibres and reducing the length of the staple, was not new in practice, and had been resorted to under Hall's Patent, though in a different manner from that employed upon this occasion. Now, suppose a patent to have been first obtained for some entirely new method, either chemical or mechanical, of reducing the fibres of flax to a short staple, we think that a second patent could not be taken out for an improved mode of machinery in spinning flax, which consisted of nothing more than the spinning of the short staple of flax by a spinning machine, with a reach of a given length not less then that already in use for the spinning of cotton, the effect of which would be to prevent the first patentee from working his invention with the old machine at the proper reach. And if a patent taken out for that object separately would be invalid, so also a patent taken out for an invention consisting of two distinct parts, one of which is that precise object, would be void also.

"The answer given to this objection on the part of the Plaintiff has been, that the invention for which the patent has been taken, does not consist of two distinct parts, but has but one entire single object only, namely, the object of macerating and spinning that macerated flax, on a machine where the rollers are retained at the prescribed distance from each other. But this appears to be at variance with the specification itself, which divides the invention and the subject matter of the patent into two distinct parts; and even if it is to be considered as one entire invention, if part of what is claimed is not properly the subject of a patent, or not new, the whole must be void."

We shall therefore certify to His Honour that in our judgment the Patent in question is not valid in law.

This opinion was laid before the Master of the Rolls, at Westminster, at the sittings in Trinity Term, when the following argument took place:—

Sir F. Pollock, on behalf of the plaintiff, (Kay) insisted that though the two parts of the invention, the macerating and the drawing, are acknowledged not to be new separately, yet collectively they are new, and form a fit and proper subject for a patent, as producing a new effect.

Mr. Kindersley, on the same side, argued that the judges were wrong in considering the specification as claiming the two parts separately. Lord Langdale said the machinery is evidently not new, as all sorts of *reaches* have been before made; what then is the *improved machinery ?*. Mr. Kindersley observed that there never was a machine before that of the plaintiffs in which the position of the drawing rollers was fixed at *two and a half inches*, though machines have been made having the rollers at all other distances, from one inch upwards. Macerating the flax is also admitted not to be new, but macerating does not shorten the fibres of the flax, it merely allows the fibres to slip. The invention, therefore, is the combination of these two to produce a new result; for it was not known before Kay discovered it that the fibres of the flax by maceration could be drawn at so small a reach as two and a half inches.

Lord Langdale considered that the opinion of the judges was, that the patent was bad in point of law; he could not, therefore, perceive what relief was sought by the plaintiff. Hall's patent was for simply wetting the flax, but Hall did not know the proper length of the reach at which the flax, when macerated, could be drawn. Kay found it was two and a half inches; he therefore claims for this discovery an injunction against the defendants.

Mr. Booth, on the plaintiff's side, argued that the plaintiff is entitled to a decree, because the defendant's plea has not been maintained;—he might have pleaded the invalidity of the patent from want of novelty, but he rests upon no novelty and no utility. The learned counsel further urged, that if this patent had been for a *new method* not a *new machine*, the patent would have been good.

On the part of the defendant, (Marshall) Mr. Pemberton said, that this is to be the final discussion of the subject; and the question is, whether the plaintiff shall have an account of profits, an injunction, and all the costs of the suits which have preceded.

The learned counsel then cited the case of Millington and Fox, which was an application for an injunction in a patent question. The defendant had submitted, but the plaintiff persisted in his application for an injunction, and, in consequence, had all the costs to pay. The plaintiff admits that he has laid aside his macerating apparatus; but says that the defendants have used the machinery for drawing, having the two and a half inches reach. Lord Chancellor Cottenham has said, that if the specification is sufficient, it can be of no consequence whether a distinct claim is set out. In this specification the claim consists of two parts macerating and the mechanism. Is this an invention by which the *reach* is determined, or is it a mode of drawing wet flax by some peculiar construction of machinery? The trial at York determined the facts,—the law of which was to be determined by the Rolls. The Court found that this was some novelty and some utility, yet there was not enough novelty and utility to support a patent.

The learned counsel then argued that the plaintiff had very improperly extended the legal discussion, and thereby increased the expences to an enormous amount. Messrs. Barber and Atkinson followed on the same side, and the Court adjourned to give its decision at a future day.

JUDGMENT.

The Master of the Rolls.

This case came on upon the equity reserved upon the certificate returned by the judges of the Common Pleas, for whose consideration the case was submitted, with the question whether the patent was valid in point of law. The judges certified their opinion to be, that the patent is not valid in point of law, and the defendants thereupon insist that the plaintiff's bill ought to be dismissed with costs, and that the plaintiff ought to pay the costs of the issue and of the case.

The plaintiff contends that the opinion of the judges is erroneous, and that I ought either to give relief, (notwithstanding that certificate), or to put the question relating to the validity of the patent into some further course of enquiry.

The question before me is the same as that which was before the judges; and though I have the aid of their opinion, and, by their favor of the reasons which induced them to form that opinion, it is undoubtedly my duty to consider whether, after hearing the reasons which have been advanced on both sides, it is an opinion satisfactory to my own mind, and such as I ought to adopt.

The patent was granted for "new and improved machinery, for preparing flax, hemp, and other fibrous substances by power." And in the specification, the plaintiff declared the nature of his invention to consist in "new machinery for macerating flax and other similar fibrous substances previous to drawing and spinning, and also in improved machinery for spinning the same, after having been so prepared."

Nothing has occurred to shew that the plaintiff's machinery for macerating flax previously to drawing and spinning, was not new at the time when the patent was granted; and nothing has occurred to shew that previously to the grant, it was known that maceration to the extent of the whole was not a new process by which flax was usefully prepared for drawing and spinning; and so far as relates to the maceration and the machinery for the maceration described in the patent, no mention is made as to the novelty and utility of the plaintiff's invention. And, if this were all, the validity of the patent would not be affected by the fact, that before the grant, a mode of preparing the flax for spinning by moistening it, had been invented by Horace Hall, or, that subsequently to the grant, a more convenient mode of maceration had been invented and come into general use; but, with respect to improved machinery for spinning, the plaintiff in his specification says, "I place the drawing rollers only 2½ inches from the retaining rollers, and this constitutes the principal improvement in the said spinning machinery; for the roving being so completely macerated, would not hold together to be drawn out, while in such a state, to the ordinary length of the staple; but this very state, when drawn in so short a length as here represented, enables it to be spun very fine and evenly;" for it should be stated, that there is no elasticity in the fibre of flax, hemp, nettle, weed, or other the like substance; but when drawn by rollers so placed as aforesaid, and moving at the relative speeds aforesaid, which he has previously described to be 8 to 1, and in the completely saturated state aforesaid, the fibres themselves are pulled asunder and require to be twisted immediately, or the continuity of the thread would be destroyed. And, again, in specifying his claim, he declares, "that that which he claims as his invention in respect of improved machinery for spinning flax, hemp, and other fibrous substances, is a certain trough which he has described, and the placing the drawing and retaining rollers nearer to each other than they have before been placed, say within 2½ inches of each other, for the purpose aforesaid."

From this specification, it appears to have been known to the plaintiff, that the fibres which were to be spun after maceration, would be pulled asunder by drawing in this manner, and require to be twisted immediately to prevent the continuity of the thread being destroyed; and therefore, he placed the drawing and retaining rollers very near to each other. He has declared, that this placing of the rollers constitutes the principal improvement in the spinning machinery; and, amongst the things which he claims as his invention, is this placing of the rollers nearer to each other;—"nearer than they have been placed, say within 2½ inches, for the purpose aforesaid." And it is indorsed on the postea by the learned judge before whom the issue was tried, "that before the granting of the patent, it was not known that flax could be spun by means of maceration, as having a short fibre, at a ratch of 2½ inches." But in various sorts of spinning machines which were used before the granting of the patent, there were slides, by which the ratch was varied according to the length of the staple or fibre; "for cotton spinning, the ratch varied from 7-8ths to an inch and a quarter; for tow spinning, from 4 to 9 inches; for worsted spinning, from 5 to 14 inches; for flax or line spinning, from 14 to 36 inches." So that machinery, by which the ratch was varied from less than an inch to 36 inches, was known before the granting of the patent. The plaintiff has found, that a ratch of $2\frac{1}{2}$ inches or thereabouts, is well adapted for spinning flax prepared for spinning by his process of maceration; and the question is reduced to this,—whether his adopting that particular length of ratch for the purpose of applying it to the spinning of flax so prepared, is to be considered an improved machinery in respect to which this patent can be held to be valid.

I am of opinion, that it cannot. I concur entirely with the learned judges, and see no reason to think that any other result would follow further investigation.

Being of opinion that the patent is invalid, it follows, that the bill must be dismissed. I have considered the question of costs, and under all the circumstances, I think I ought to make no order with respect to the costs of the issue; but that the plaintiff ought to pay the costs of this suit and of the case.

Mr. Barber.—Bill dismissed with costs, that is the order, and no costs of the issue.

The Master of the Rolls.—The bill dismissed with costs, and no costs of the issue.

Pending the above discussion, Mr. Kay applied to the Privy Council for an extension or prolongation of his patent right, under the act to amend the laws touching letters patent for inventions. (Guli. IV. cap. 83, clause 4.) But, as the Privy Council had no power, under that act, to prolong the term of a patent right after the patent had expired, it was agreed by the Privy Council, before the above decision of the cause, that a further term of three years, from the 26th July, (at which time the original patent expired,) should be granted to Mr. Kay for his invention. The above decision, however, has rendered the extension useless.

List of Patents

Granted for Scotland subsequent to 22d August, 1839.

Patent granted to James Capple Miller, of Manchester, in the county of Lancaster, gentleman, for an invention of "certain improvements in printing calicoes, muslins, and other fabrics." —Sealed 26th August, 1839.

Ditto to Barclay Farqutearson Watson, of Lincoln's Inn Fields, in the county of Middlesex, solicitor, in consequence of a communication from a certain foreigner, residing abroad, for an invention of "improvements in crushing or preparing new Zealand flax, (Phornium Tenax)."—Sealed 4th September, 1839.

Ditto to Mathew Uzietti, of King William-street, in the city of London, merchant, in consequence of a communication from a certain foreigner, residing abroad, for an invention of "improvements in impregnating wood or timber with chemical materials."—Sealed 4th September, 1839.

Ditto granted to John Augustus Tulk, of Seaton and Lowca Iron Works, Cumberland, iron master, for an invention of "improvements in the manufacture of Iron."—Sealed 4th September, 1839.

Ditto to Frederick Parker, of New Gravel-lane, Shadwell, in the county of Middlesex, animal charcoal manufacturer, for an invention of "improvements in revivifying or restoring animal charcoal."—Sealed 6th September, 1839.

Ditto to John Dickson, of Brook-street, Holborn, in the city of London, engineer, for an invention of "improvements in rotatory steam engines."—Sealed 6th September, 1839.

Ditto to William Hale, of Greenwich, in the county of Kent, engineer, for an invention of "improvements in steam engines and apparatus connected therewith, and in machinery for propelling vessels, part of which improvements are applicable to raising or forcing fluids."—Sealed 7th September, 1839.

Ditto to Robert Carey, of Brengar, near Sittingbourne, in the county of Kent, in consequence of a communication from a certain foreigner, residing abroad, for an invention of "certain improvements in paving or covering streets, roads, and other ways."—Sealed 17th September, 1839.

CELESTIAL PHENOMENA, FOR OCTOBER, 1839.

D.	H.	M.	
1			Clock after the sun, 10m. 11s.
	—		☽ rises 11h. 14m. A.
	—		☽ passes mer. 7h. 13m. M.
	—		☽ sets 3h. 44m. A.
2			Gambart's Comet R. A. 12h. 29m. dec. 10. 8. S.
			Ditto passes mer. 23h. 44m.
5			Clock after the sun, 11m. 25s.
	—		☽ rises 3h. 39m. M.
	—		☽ passes mer. 10h. 20m. M.
	—		☽ sets 4h. 45m. A.
	14	29	♀ in inf. conj. with the ☉
6	14	57	☿ in conj. with the ☽ diff. of dec. 3. 57. N.
	16	58	♀ in conj. with the ☽ diff. of dec. 6. 16. S.
			Gambart's Comet R. A. 12h. 41m. dec. 11. 16. S.
			Ditto passes mer. 23h. 40m.
7	1	36	☿ in conj. with ♀ diff of dec. 10. 14. N.
	2	13	Ecliptic conj. or ● new moon
8	6	34	♃ in conj. with the ☽ diff. of dec. 4. 52. N.
9	22		☽ in Apogee.
10			Clock after the sun, 12m. 49s.
	—		☽ rises 9h. 40m. M.
	—		☽ passes mer. 1h. 47m. A.
	—		☽ sets 5h. 45m. A.
	—		Gambart's Comet R. A. 12h. 52m. dec. 12. 21. S.
			Ditto passes mer 23h. 36m
11	14	55	♂ in conj. with the ☽ diff. of dec. 4. 7. N.
	16	7	♄ in conj. with the ☽ diff. of dec. 6. 47. N.
12	1	32	Juno in oppo. to the ☉ intens. of light 4,053
	13	53	♂ in conj. with ♄ diff. of dec. 2. 40. S.
14			Gambart's Comet R. A. 13h. 3m. dec 13. 22. S.
			Ditto passes mer. 23h. 32m.
15			Clock after the sun, 14m. 2s.
	—		☽ rises 2h. 31m. A.
	—		☽ passes mer. 6h. 2m. A.
	—		☽ sets 9h. 39m. A.
	6	25	☽ in □ or first quarter
	15	42	☿ in sup. conj. with the ☉
16			Mercury R. A. 13h. 25m. dec. 8. 3. S.
	—		Venus R. A. 12h. 13m. dec. 8. 13. S.
	—		Mars R. A. 16h. 32m. dec. 23. 2. S.
	—		Vesta R. A. 12h. 10m. dec. 4. 6. N.
	—		Juno R. A. 1h. 24m. dec. 4. 31. S.
	—		Pallas R. A. 15h. 18m. dec. 6 43. N.
17	—		Ceres R. A. 15h. 15m. dec. 15. 40. S.
	—		Jupiter R. A. 13h. 44m. dec. 9. 40. S.
	—		Saturn R. A. 16h. 23m. dec. 20. 2. S.
	—		Georg. R. A. 22h. 58m. dec. 7. 24. S.
	—		Mercury passes mer. 23h. 50m.
	—		Venus passes mer. 22h. 31m.
	—		Mars passes mer. 2h. 55m.
	—		Jupiter passes mer. 0h. 7m.
	—		Saturn passes mer. 2h. 45m.
17			Occul γ in Capricorni im. 11h. 16m.
	6	52	♀ in conj. with Vesta diff. of dec. 11. 37. N.
18			Occul 58 Aquarii im. 10h. 50m. em. 11h. 48m.
19	3	3	Her: in conj. with the ☽ diff. of dec. 0. 40. S.
	13	52	☿ in conj. with ♃ diff. of dec. 0. 39. S.
	—		Occul φ Aquarii im. 5h. 4m. em. 6h. 7m.
20			Clock after the sun, 15m. 1s.
	—		☽ rises 3h. 59m. A.
	—		☽ passes mer. 10h. 10m. A.
	—		☽ sets 3h. 12m.
22	4	32	Ecliptic oppo. or ○ full moon
	16	36	♃ in conj. with ☉
			Gambart's Comet R. A. 13h. 25m. dec. 15. 14. S.
			Ditto passes mer. 23h. 22m.
	19		☽ in Perigee.
23	12	14	☿ in the descending node.
	—		Occul 47 Arietis im. 6h. 3m. em 7h. 23m.
24	2	56	♀ stationary.
25			Clock after the sun, 15m. 45s.
	—		☽ rises 5h. 57m. A.
	—		☽ passes mer. 1h. 57m. M.
	—		☽ sets 10h. 56m. M.
26			Gambart's Comet R. A. 13h. 35m. dec 16. 5. S.
			Ditto passes mer. 23h. 16m.
29			Occul q Cancri im 11h. 6m. em 11h. 52m.
29	8	0	☽ in □ or last quarter.
30			Clock after the sun, 16m. 11s.
	—		☽ rises morn.
	—		☽ passes mer. 6h. 52m. M.
	—		☽ sets 2h. 29m. A.
			Gambart's Comet R. A. 13h. 40m. dec. 16. 54. S.
			Ditto passes mer. 23h. 10m.
31			Occul 59 Leonis im 15h. 2m. em 16h. 1m.

The Satellites of Jupiter are not visible this month, Jupiter being too near to the Sun.

J. LEWTHWAITE, Rotherhithe.

THE

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CONJOINED SERIES.

No. XCII.

Recent Patents.

To William Newton, *of the Office for Patents, Chancery-lane, in the county of Middlesex, civil engineer, for certain improvements in machines for drilling land, or sowing seed and grain of different description; being a communication from a foreigner residing abroad.*—[Sealed 11th January, 1839.]

This invention, communicated to me by a foreigner residing abroad, is a machine for drilling or sowing grain or seeds in ploughed land, one peculiar novelty of which is considered, by the inventor, to consist in the sowing wheel, whereby the seeds, without the risk of bruising them, may be taken one by one and conducted with uniformity and precision into the furrow made by the progress of the machine as it passes over the land.

Plate IV., fig. 1, represents a horizontal view of the machine; fig. 2, is a section taken vertically through the same; *a, a,* are the side frames or carriage of the machine; *b, b,* transverse rails connecting the sides together; *c, c,* are the two running wheels on which the machine passes over the ground;—these are fixed upon an axle *d.* A pulley *e,* (or several distinct pullies of different diameters,) is to be fixed on the axle *d*; but capable of being slidden sideways upon the axle for adjustment. Over this pulley an endless band or chain *f, f,* is passed, for the purpose of giving rotary motion to the sowing wheel *g.*

The sowing wheels are thus described by the inventor.—These wheels are formed of two parts united together; they are scoped out in the circumference, in the manner represented in fig. 1, and in the detached sectional fig 3. A metallic partition, placed between the two portions of the sowing wheel and extending to the height of the outer periphery of the wheel, prevents the seed in the channel of one from dropping into the other. On the largest diameter of each of these portions of the wheel, are placed at suitable distances apart, (according to the seed to be sown,) small hands of tin, or other suitable material; these take up the seed one at a time, from the box below, as the wheel revolves. When the endless chain or band *f, f,* is driven by the largest pulley *e,* a greater number of seeds are distributed over a given space of ground, than when the chain is worked by the lesser pulley; and a smaller quantity still will be distributed, when the smallest pulley drives the chain or band.

The pulley is made to slide on the axletree, in order that either of the different diameters may, when required, receive the chain or band, which must preserve a rectilinear direction with the pulley *o,* on the axle of the sowing wheel; and when so placed, must be fixed by a key or screw or any other well known and convenient method.

The pulley, as seen in fig. 2, sets in motion only two sowing wheels, but a greater number fixed on the same axle might be driven in the same way.

The machine is to be drawn from a staple in front, either by horse or manual labour; the handles at the back part being for directing the machine. Two rollers *n*, *n*, at the back, are for supporting the hinder part of the machine and pressing the earth, when the nature of the seed sown may require it. *i*, is an iron or wooden colter, to push out of the way such lumps of earth as might be injurious to certain seeds; this colter may be dispensed with when not found necessary. *j*, *j*, represents frames of harrows or rakes for harrowing the earth, after the seed has been deposited in the furrow. These harrows are supported by a transverse bar at the hinder part of the carriage, and may be made with any suitable number of teeth. *k*, is a ploughshare, opening the furrow which is to receive the seed; it has two wings or ears behind, which guard the distributing tube and hinder the earth from falling in before the seed is deposited.

The drilling machine being drawn by men or horses, according to the number of furrows or ridges it is intended to make and sow at once, the running wheels *c*, *c*, will turn their shaft or axle, and the pulley being fast on the said axle, as described, it will cause the endless chain *f*, *f*, to travel round, and thereby to give rotary motion to the sowing wheels. As these wheels revolve, the small hands, which project from their circumference, will take up the seeds deposited in the bottom of the box *w*, and passing by the small brush *r*, will be carried along by the revolution of the wheel until they have arrived at the point *x*, where the small hand begins to descend and to drop the seed into the recess formed in the wheel, where the seeds are confined by the segment *m*, and spring *n*. When by the revolution of the sowing wheel the seed shall have been carried to the extremity of the segment, it will be enabled to drop into the distributing tube *o*, and be thus deposited in the ridge or furrow, traced by the ploughshare *k*; the harrow *j*, then fills up the furrow opened by the ploughshare, and covers over the seed; and the rod *i*, pushes away the lumps of earth or stones, if any; and the roller *h*, levels the ground when the operation is completed.

It might be necessary for certain seeds, such as rape and and the like, to diminish the friction caused by the segment *m*, which covers the grooved chambers of the sowing wheels; in that case, the said segment *m*, should be internally lined with leather.

The proper thickness of the sowing wheels is determined by the quality of the seeds they are to sow. They may be made either in wood or metal; they must be fixed on the shaft *p*, which is driven by the pulley *o*, by means of the endless chain or band *f*, *f*, and the small brush *r*, of flexible hair, is to be fixed on a sliding plate; the object of such brush being to drive out of the hands any extra seeds that might have got into them.

The sliding plate affords the means of withdrawing the brush *r*, when that is not deemed necessary. The hopper *s*, for the supply of the seeds, is placed behind the sowing wheel, from which it is separated by a partition *v*; this hopper has an opening at the lower part for the delivery of the seeds, which are to be taken up by the small hands. The delivery from the hopper, is regulated by a register raised and lowered, at will, according to the required quantity of the seeds. For larger seed, the register must give a greater aperture at the bottom of the hopper.

A graduated index is marked on the partition *v*, for the purpose of indicating the depth to which the register must be driven, according to the various kinds of seeds. The box *w*, *w*, surrounding the sowing wheels, is opened at top by means of a cover, seen closed in fig. 2; several sowing wheels might be contained in the same box.

It may be here remarked, that the diameter of the sowing wheels should be almost always the same for agricultural purposes, though for horticultural purposes they might be made smaller. The size of the small hands and that of the curved cuts, on the periphery of the wheel, should be varied according to the grain or seeds to be sown.

The machine, represented in the annexed drawing, is calculated to sow at once two ridges; it is for that purpose provided with two sowing wheels, two ploughshares, two distributing tubes, two harrows or rakes with four teeth, and two rods or colters for driving the lumps of earth out of the way

In order to sow at once a greater number of ridges, the above pieces are increased in due proportion.

The pullies *e*, must be modified according to the extra work they are called upon to execute. One or several tension pulleys *u*, serve to tighten, to a proper degree, the chain or band *f*, *f*; these pullies and their use being well known, need not be further described. The drawing wheels c, c, may be placed inside or outside the frame, as found most convenient.—[*Inrolled in the Rolls Chapel Office, July*, 1839.]

Specification drawn by Messrs. Newton and Berry.

To ROBERT THOMAS, *of St. James's street, in the city of Westminster, and county of Middlesex, boot-maker, for his invention of certain improvements in apparatus to be attached to carriages, for the purpose of preventing horses from starting; and for stopping or restraining them when running away; or descending hills.*—[Sealed 7th June, 1838.]

THESE improvements consist in the adaptation of an apparatus to carriages, whether on two or four wheels; by means of which, the horse or horses may be drawn up or tightly curbed in, so as to prevent their proceeding, by means of a cord, to be connected to the bit or curb; such cord being wound round a rotary barrel, when the barrel has been thrown into gear with one of the running wheels, which may be done by any person riding on or in the carriage.

Plate IV., fig. 6, represents the front elevation of a pair of wheels, mounted upon their axle in the ordinary way, the improved apparatus being connected therewith. Fig. 7, is a horizontal view of the same. Figs. 8, and 9, are elevations similar to fig. 6, shewing the apparatus in different stages of its action. Fig. 10, represents the apparatus detached, and drawn upon an enlarged scale, shewing the parts partially in section and out of action. Fig. 11, represents the same also, partially sectional, and exhibiting the parts in action.

Similar letters of reference point out the same parts in all the figures. *a, a,* is a shaft or spindle of metal placed horizontally and parallel to the stationary axle of the running wheels; the said shaft or spindle turns freely, and is capable of sliding in brackets *b, b,* fixed to the stationary axle. A tube *c, c,* attached by its flange to the tube *d,* embraces the spindle, but allows it to turn and move freely within it; *d,* is the other tube of larger diameter, capable of sliding over the spring *f,* which tube constitutes the barrel for the cord or band *e,* to be wound upon; this cord or band being intended to be connected by a pair of branch cords or reins direct to the curb or bit in the horse's mouth, and also, if required, to loops passed over his ears and the bearing rein.

Within the tube *d,* the open worm spring *f,* is placed coiled around the spindle *a,* having one of its bearings against the end of the tube *c,* and the other against a collar *g,* fixed on the spindle.

At the outer end of the spindle a similar open worm spring *h*, is attached, having one of its bearings against the bracket *b*, and the other against a nut and washer *i*, on the outer end of the spindle. The reverse end of the spindle *a*, has a pinion *k*, firmly secured upon it, and upon the inner rim *l*, of the nave of the running wheel: a ring of teeth is also fixed, in order that when the pinion *k*, is slidden into gear with the rim of teeth *l*, the rotary motion of the running wheel may communicate a similar motion to the spindle *a*, and to the barrel *d*, for winding up the cord.

The tubes *c*, and *d*, are connected, in the following manner:—a coupling collar *m*, is placed upon the tube *c*, which embraces a slit or groove on the end of the tube *d*; a cord *n*, is attached to a stud fixed in the tube *c*, and is intended to draw the tubes *c*, and *d*, along, for the purpose of locking the latter to the spindle, the tube *c*, being guided by a feather or nib inserted into a slit in it.

A pin is passed through the spindle at *o*, *o*, for the purpose of being acted upon by the clutch *p*, *p*, at the end of the barrel *d*, when that barrel is slidden onward.

The cord *n*, attached to the sliding tube *c*, is carried under a guide pulley *q*, and conducted to the seat of the driver, or to any other part of the carriage that may be required; indeed I prefer that this cord *n*, when the apparatus is applied to a coach, should have three branches, one leading to the box seat, one to the hinder part or dickey, and one to the interior of the carriage, as shewn in figs. 12, and 13.

The apparatus being now described, I proceed to explain the manner in which it is brought into operation. In the first instance it will be perceived, in referring to the quiescent state of the apparatus shewn at figs. 6, 7, and 10, that the power of the spring *h*, forces the spindle *a*, back, and thereby keeps the pinion *k*, out of gear with the toothed rim *l*, on the running wheel; and also that the force of the spring *f*, keeps the tubes *c*, and *d*, back, and prevents the clutch *p*, *p*, from locking against the pin *o*, *o*, fixed in the spindle *a*; consequently, under these circumstances, (which is the ordinary position of the apparatus, no connexion existing between the barrel *d*, and the running wheel,) the carriage proceeds as usual, and the cord *e*, hangs loosely without affecting the horse. (see fig. 7.) But, in the event of the horse or horses starting or getting into a greater speed than may be desired, the driver or any other person riding on or within the carriage, takes hold of the ends of one of the branches of the cord *n*, and draws it up until, by the sliding of the tubes *c*, and *d*, as described above, the clutch *p*, *p*, is brought into contact with the pin *o*, *o*, as shewn in figs. 3, and 6, and thereby couples the spindle *a*, with the barrel *d*.

The barrel *d*, not being enabled, by the arrangements of the parts, to slide further, the draft of the cord *n*, will now act upon the spindle, (the abutment being at the collar *g*,) and draw the spindle onward until it has slidden sufficiently far to put the pinion *k*, in gear with the toothed rim *l*, on the running wheel.

It will now be perceived, that as the running wheel goes round, the spindle *a*, with the barrel *d*, will be made to revolve; and that the cord *e*, attached thereto, (and at its other end connected to the bit or curb of the horse or the bearing rein,) will be made to coil round the barrel *d*, as shewn at figs. 4, and 6; and by so coiling, cause the branch cords or reins to be drawn tightly, and bring up the horse.

Fig. 12, represents a four-wheeled carriage, drawn by one horse, the improved apparatus being attached thereto, but very imperfectly seen, as it is desirable to conceal the apparatus, as much as possible, from public view. The drawing-up reins or cords *e*, pass from the bit or curb in the horse's mouth, or from the bearing rein, in any convenient way under the carriage to the barrel *d*, upon the spindle *a*: and in this figure it is to be supposed that the apparatus is not thrown into gear, as the horse has but just started off; but in the event of it becoming necessary to check the speed of the horse, the driver, or some person within the carriage, draws the cord *n*, which throws the apparatus into gear, in the way described, and brings the horse up, as shewn in fig. 13.

It is necessary to add, that if the cord *e*, leading from the curb or bit of the horse, were to be immediately coiled upon the barrel *d*, with the speed with which the barrel is made to turn when thrown into gear with the running wheel, that the horse would be drawn up too suddenly; I therefore connect the cord *e*, to another cord, passed round a spring barrel, not shewn in the drawings; so that while the cord *e*, is winding round the barrel *d*, a length of cord is given out from the spring barrel, which thereby causes the tension of the rope upon the curb or bit to operate gradually, and to temper the check, until the horse has had time to feel the force exerted upon him, and quietly to submit to its restraint.

And further I would remark, that as soon as the driver or other person in the carriage lets go the cord *n*, that the springs *f*, and *h*, being free, force back the spindle *a*, thereby throwing the pinion *k*, out of gear; and also unlock the barrel *d*, from the spindle, when the apparatus assumes the inoperative position shewn at figs. 6, 7, and 10.

And as a further security against the horse rearing up on being checked by the above described apparatus, I apply loops of catgut or cord over his ears; these loops being connected to the check cord *e*, which, when brought into action, will pull the loops tight upon his ears and prevent his rising.

Fig. 9, is a representation of the head gear of the bridle, shewn on a larger scale than in figs. 7, and 8. *a*, *a*, are the side or check pieces of the bridle, which are in this instance made hollow for the ends of the loops *b*, *b*, to be passed down them to the check cord *e*, at the bit *d*. *e*, is a coiled spring, its ends being attached to both the loops, for the purpose of drawing up the loops when the apparatus is out of action, and thereby relieve the horse from the pressure on his ears.—[*Inrolled in the Rolls Chapel Office, December*, 1838.]

Specification drawn by Messrs. Newton and Berry.

To JOHN HAWKSHAW, *of Manchester, in the county of Lancaster, civil engineer, for his invention of certain improvements in mechanism or apparatus applicable to railways, and also to carriages to be used thereon.*—[Sealed 17th December, 1838.]

THESE improvements consist, firstly, in a novel construction of apparatus to be attached to or applied upon railways, at those parts termed switches, shunts, or moveable rails, which are commonly used for transferring engines, carriages, or trains, from one line of rails to another, as occasion may require, and which apparatus I call a "switch or shunt protector."

In the generality of such cases there is one position of the switches, shunts, or moveable rails, which is necessary for the thorough or principle traffic, and in which direction the trains may have to pass at a maximum velocity, while the change of direction that is given by the other position of the switches or shunts, is less frequently required, and is chiefly passed over by trains at a slow rate. The principle object of this invention, therefore, is to secure the switches or shunts being held or kept in a proper position at all times for the principal or thorough traffic; and when there is occasion to transfer the trains or engine, &c. to another line than that upon which the chief traffic passes, it has to be done by some person holding the switch protector in a proper position for the purpose; and immediately after such transfer from one line to the other has been effected, he lets go his hold upon the handle of the apparatus, and it will instantly, from its self-acting construction, return to its original position, moving also at the same time, by its own action, the switches, shunts, or double rails to, and retaining them in, the right direction for the principle or thorough traffic, and thus prevent the possibility of the main lines of rails being left unconnected. Secondly, my improvements applicable to railways, consist in the application of an extra plate to the moveable rails, (which have hitherto been objectionable,) in-order to render their use perfectly safe, as this plate, being furnished with an inclined plane, and being also used in connection with my improved shunt protector, as hereafter particularly described, enables double rails to be employed in some cases with more convenience than switches or shunts, and is thus of considerable advantage. Thirdly, my improvements are applicable to carriages to be used upon railways, and consist in a contrivance for attaching engines, carriages, or waggons, to each other, and for the purpose of bringing them in closer connection with each other. This object is effected by a single movement, and by means of a small excentric, worked between the two ends of the connecting link; but as the excentric is a substitute for a crank, and consequently the crank may also be here used as a substitute for the excentric, then this carriage connecting link may be made to be worked either by an excentric or by a crank.

But, in order that my improvements may be more readily explained, I have attached to these presents a sheet of drawings illustrative of the following more detailed description thereof, and marked the same with figures and letters of reference; similar letters being placed upon corresponding parts of the mechanism. (See Plate V.)

Fig. 1, is a front elevation of my improved self-acting mechanism, to be applied to railways, having the front plate removed in order to shew the interior of the apparatus. Fig. 2, is a plan or horizontal view of the same, with the top removed for the same purpose, and here shewn in connection with a moveable or double rail. Fig. 3, represents its connection with an ordinary switch or shunt; and fig. 4, is a vertical section of the apparatus.

The main line of railways, or that used for the thorough or principal traffic (in the direction of the arrows) is shewn at *a*, *a*, and the diversion of the line at *b*, *b*; the rails or shunts are connected to the apparatus, or "shunt protector," by the horizontal rods *c*, *c*, and actuated by the excentric *d*, in the usual manner.

In order to move the switches or shunts, and to bring the main feature of my improvements into operation, the railway attendant has to depress the lever *e*, into the horizontal position, and hold it there while the train is passing from the main line *a*, *a*, upon the diversion at *b*, *b*, which will bring the parts into the position shewn by dotted lines in figure 2. Thus the depression of the lever *e*, has, by means of the bevel wheel *f*, upon the shaft *g*, and the pinion *h*, upon the shaft *i*, caused the excentric *d*, to perform half a revolution, and consequently to move the shunts or switches, and at the same time to raise the balance weight *k*, which is keyed to and suspended upon the shaft *g*.

Now, when the train has passed from the main line to the diversion, the instant the attendant releases his hold on the lever *e*, this combination of mechanism, that is, the connection of the balance weight, the bevil wheels and the excentric, immediately brings the rails or switches into their former position, and thus always preserves the right direction of the line for the principle or thorough traffic. In order also to ensure a still greater degree of safety, the same movement which actuates the excentric, is by means of the mitre wheels *l*, *m*, made to turn the upright spindle *n*, with an outside signal, which shews to the engine-man the position of the shunts; of course, this external part of the apparatus, may be constructed in a variety of ways. I have hitherto employed a plane or disc *o*, painted black and white, and it is so placed, that the plane of the disc is parallel to the direction of the rails, when the switches are right for the through or principle traffic, and consequently, in a position not to be seen by the approaching engine-man, excepting edgewise. It will thus be evident, that the same motion which actuates the switches, turns this signal a quarter of a revolution and brings it into the full view of the engine-man.

To make the same part of this apparatus equally applicable at night, it only requires to have a common lamp fixed in the centre of the disc *o*, which will of course be fully visible or not visible, under the same circumstances as those just described. It will be seen by reference to fig. 2, that there is also attached to the moveable rails an extra plate or way *p*, *p*, which is formed with a slight inclined plane *q*, upon its surface, in order to lift any engine or carriage which may accidentally be passing along the line of rails *b*, *b*, and thus easily pass or guide such carriage upon the main lines *a*, instead of allowing it to escape from the ends of the diversion line *b*, *b*, and be thrown off the rails entirely; this improvement will be found to effect a still further security against accidents, and should be used in connection with the apparatus above described, as shewn in fig. 2.

My improved connecting link for attaching engines and carriages, and bringing them in closer connection with other in trains, is exhibited in fig. 5, which is a side elevation, and fig. 6, which is a plan or top view of the same. *a, a,* are the eyes of the link to receive the hooks which are upon the ends of the carriages to be connected. Upon one of these eyes, is formed a circular race or rim *b,* in which the excentric wheel *c* works; this excentric is fixed upon a small stud *d,* to which the other eye is attached by the parallel arms *e, e*; there is a handle or lever *f,* also keyed upon this stud for the purpose of turning the excentric in the grooved rim *b,* and thus it will be evident, that by a single movement of the handle, causing a semi-revolution of the excentric, the connecting link may be lengthened or shortened at pleasure, as shewn by dotted lines in fig. 5. There is a small spring catch *g,* working on a stud in the arm *e,* which enters or catches into a recess in the excentric, when a half revolution has been performed, and thus holds or secures the connecting link in its shortened position.

Having now particularly described my improvements and the manner in which the same may be carried into operation, I desire it to be understood, that I claim as my invention the particular combination of mechanism above described and shewn in the drawings attached for the purpose of working the shunts, switches, or double rails, upon railways; and thus, after the transfer of any engine, carriage, or train, keeping the line for the thorough or principle traffic always entire; and also, the mode of connecting engines, carriages, or trains, by the improved link shewn in the carriage.—[*Inrolled in the Rolls Chapel Office, June,* 1839.]

Specification drawn by Messrs. Newton and Berry.

To William Holme Heginbotham, *of Stockport, in the county of Chester, gentleman, for his invention of certain improvements in machinery or apparatus, for propelling boats and other vessels to be employed either for marine or inland navigation, and to be worked by steam or other power.*—[Sealed 17th January, 1839.]

These improvements consist in the peculiar construction and arrangement of certain mechanism or apparatus, to be substituted for, and employed in the place of ordinary paddle wheels as generally used, for the purposes of propelling vessels; and have for their particular object the property of presenting the edge of the paddle board to the water, when entering and retreating from it, having a much greater hold or resistance than the ordinary paddle wheel; and at the same time not having any "backwater" resistance to overcome.

Another peculiar feature of novelty and improvement in my present invention, consists of the compactness, both in breadth and depth of the propelling apparatus, which renders the same particularly applicable to canal boats, and also to ships of war; for in the latter instance, the whole of the line of guns may be employed, not being necessarily broken by the paddle box, as in ordinary steam vessels,—and in the former, no great displacing of the water taking place, the banks of the canals are not injured.

In order that the improvements may be more perfectly explained, and their application to all the purposes of propelling vessels, properly understood, I have attached to these presents, a sheet of drawings, containing such views of my improved apparatus, and its peculiarly advantageous appliance to ships of war, as will sufficiently illustrate my invention; having marked the same with figures and letters of reference, placing similar letters upon corresponding parts of the apparatus, in all the figures.

Plate V., fig. 6, represent a side elevation of a steam ship or war brig, with my propelling apparatus attached, having the front of the paddle box removed; fig. 7, being an end or stern view of the same. Fig. 8, is a side elevation of my apparatus, detached and drawn upon a larger scale; fig. 9, is a plan or horizontal view; and fig. 10, an end view of the same, with the side of the vessel, and the paddle box drawn in section, in their relative positions. This propelling apparatus is to be placed upon each side of the vessel and to be actuated or driven by the engines exactly in the same manner as ordinary paddle wheels are now driven, consisting of a series of vertical paddle boards *a, a, a, a,* which are mounted or fixed in suitable iron carriages or framings *b, b, b, b;* the extremities of the frames are furnished with bearings *c, c, c, c,* and attached to a pair of double cranks *d, d, d, d,* of such a sweep or throw, that at every revolution, each paddle board in one carriage shall pass over two paddles in the other carriage, as shewn in fig. 8, where the paddle d_1, in the upper frame, is seen just about to pass over paddle a^2, in the lower carriage, and thus by the revolutions of the cranks, the upper and lower carriages or frames, with their system of paddles, will descend and act in the water alternately. It will be seen that the outer ends *e, e,* of the crank shafts, must have their support or bearings placed in the side of the paddle box *f, f,* and that the shafts *g, g,* themselves, must extend entirely through the vessel from one side to the other; having the engines or driving power in the centre, between the two crank shafts, and connected to them by suitable gearing.

Having thus described my improvements in machinery or apparatus for propelling boats or other vessels, and the manner of carrying the same into practical operation, I desire it to be particularly understood, that I claim as my invention (and which is secured to me by the above-named letters patent) the peculiar and novel arrangement of the mechanism herein described and shewn in the drawings for the purposes and in the manner therein set forth, without being in any way confined to the number or shape of the paddle boards, or either to the materials or dimensions of which the apparatus may be constructed.—[*Inrolled in the Rolls Chapel Office, July*, 1839.]

Specification drawn by Messrs. Newton and Berry.

To SAMUEL HALL, *of Baseford, in the county of Notts, cotton manufacturer, for his invention of an improved method of lubricating the pistons, rods, and valves, or cocks of steam engines; and of condensing the steam of such engines as are worked by a vacuum produced by condensation; also a method of condensation applied to other purposes.*—[Sealed 9th January, 1833.]

THIS invention is described as consisting of improvements on a former patent granted 22d December, 1831, (see vol. I., of our present Conjoined Series, page 361 and plate XVIII.) The mode then proposed of lubricating the working parts of the engine by an apparatus which caused a stream of oil to pass constantly through the cylinder, appears not to have been found effective; another plan is therefore now proposed, in which the oil floating upon the surface of the water in the boiler, is taken up by an inverted cone, and pumped through tubs into the working cylinder.

Plate V, fig. 11, represents the apparatus now proposed to be employed; *a, a,* is a section taken vertically through the man-hole of the boiler; *b, b,* is a frame of rods inserted into the boiler, and made fast to the cover of the man-hole; *c, c,* is another frame of rods standing upon the outside of the cover, and supporting a vessel or chamber *d, d,* at top.

A long tube *e, e,* slides through stuffing boxes, having an enlargement *f, f,* at bottom, of a conical form; within this tube a piston or bucket *g,* is worked by any convenient means attached to the upper end of the piston rod *h,* and in the lower part of the tube there is a conical valve *i,* held down in its seat by a weight appended to its rod *k.*

In order to put this apparatus in effective operation, a lever as a pump handle is to be attached to the pins *l, l,* extending from the outside of the tube *e, e,* by which the tube *e,* may be raised or depressed. When the tube *e,* is depressed, the end of the rod *k,* strikes against the bottom rail of the frame *b,* and raises the conical valve *i,* from its seat; the enlarged part *f, f,* of the tube being at the same time immersed in the oil floating on the surface of the water in the boiler. Whilst the end *f, f,* of the tube *e,* is thus immersed in the oil, the piston or bucket *g,* is raised by drawing up the rod *h,* which causes the oil to flow up the tube *e, e,* and on raising the tube by means of the pump handle as before described, the valve *i,* will be enabled to fall into its seat and confine the portion of oil so raised within the tube.

As it is probable that some small quantity of water may be raised with the oil, two curved pipes *m, m,* branching out from the tube, are provided to take off the water and conduct it again into the boiler.

Thus, it will be perceived, that by the repeated descents of the tube *e,* and the working of the piston *i,* successive portions of the oil, floating on the surface of the water in the boiler, will be drawn up through the tube *e,* and be discharged from the top of the tube into the vessel *d,* from whence it will flow away through a lateral pipe *n,* and be conducted into the working cylinder for the purpose of lubricating the working piston and the valves.

A second feature of the invention is a mode of preventing the escape of the water from the horizontal tubes of the refrigerating vessel of the former patent shewn at fig. 8, plate XVIII. of vol. I., the ends of those tubes being now furnished with small pipes bent upwards to prevent the water flowing out of the apparatus, should it be tilted on one side, as frequently happens on ship-board.

A third improvement applies to the air pump, the foot valve of which is opened by a lever or arm, acted upon by a tappet as the pump rod ascends, which assists the operation of exhausting the condensor. A fourth improvement is the introduction of vertical partitions in the water vat of the condensor for the purpose of causing the cold water to flow up and down between the pipes, which it is considered will have a more beneficial effect than if it merely flowed through horizontally as before.

The last feature of improvement set out in the specification, consists in claiming the employment of the condensing apparatus for all other purposes besides steam engines, as for distillation and cooling liquors generally.—[*Inrolled in the Inrolment Office, July,* 1833.]

To John Ingledew, *of Edward-street, Brighton, in the county of Sussex, engineer, for his invention of an improved metallic safety wheel, and revolving axle.*—[Sealed 14th April, 1835.]

This invention is a peculiar mode of manufacturing iron wheels, principally for railroad carriages; and also a method of attaching them to carriages.

The wheels are constructed with spokes, which are shouldered up into a central ring, forming the nave, and are secured therein by transverse keys, and covered on their faces by flat disc plates. The outer ends of the spokes are made with crutched heads, secured into the iron felloe by dovetails and wedges.

The wheels are fixed to short axles, which revolve in sockets made fast to the carriage. The ends of the short axles are conical, in order to avoid friction as they revolve. —[*Inrolled in the Inrollment Office, October*, 1835.]

To WILLIAM MASON, *of Brecknock Terrace, Camden Town, in the county of Middlesex, engineer, for his invention of certain improvements on wheels, boxes, and axletrees of carriages, for carrying persons and goods on common roads and railways.*—[Sealed 24th September, 1835.]

THESE wheels are proposed to be formed by combining a series of segmental pieces of wrought or rolled iron in the form of a circle, which is to constitute the felloe. The segments are to be grooved round the periphery, and that groove filled up with wood, which will give lightness and strength. The several segment pieces are made with rebated ends, so as to overlap each other at the junctions, and the whole are to be held firmly together by a ring of iron, constituting the tire, which being fitted on whilst hot will shrink, and confine all the joints securely.

The spokes of iron are of a cylindrical form, with shoulders, their ends being inserted into mortice holes in the nave and in the felloe.

These wheels may have boxes of the ordinary construction, or the boxes may be formed of wrought iron and wood, bound round with rings or hoops of iron, which will give additional strength and lightness.

The axles are tubular, and the wheels are secured to them, on what is called the mail principle. Recesses are formed in the boxes for oil, and they are to have conical collars to prevent end motion.—[*Inrolled in the Inrolment Office, March,* 1836.]

To PATRICK SEYTON HYNES, *of Paddington, in the county of Middlesex, gentleman, for certain improvements in wheels, or axletrees and boxes; and in apparatus for retarding or locking carriage wheels.*—[Sealed 25th February, 1835.]

THIS is principally an apparatus for locking the wheels of a carriage, which is effected by allowing spring bolts, connected to the axletree, or in the under part of the carriage, to be, when necessary, projected into suitable holes in the nave of the wheel, in order to lock or prevent its rotation.

These bolts are inserted into frames or brackets affixed to the axletree, at each side of the carriage; and are projected forward by helical springs, but are confined or kept back by a cord or chain.

When it is necessary to lock the wheels, the driver, or any other person in or on the carriage, loosens the retension cord or chain, and lets the bolts fly out, when they immediately slide forward in their brackets, and project into the holes in the nave of the wheel and hold it fast. When the wheels are to be unlocked, the bolts are by means of the cord or chain withdrawn by the driver, and the carriage goes on again freely.

The boxes of the wheels have each a concentric recess formed in the solid part of the box to hold oil, and channels are cut from these recesses for the oil to flow to the axle.—[*Inrolled in the Inrolment Office, August,* 1835.]

To STANISLAUS DARTHEZ, *of Austin Friars, in the city of London, merchant, for certain improvements in the construction and arrangement of axles, axletrees, and the naves of wheels for carriages.*—[Sealed 1st December, 1838.]

THESE improvements in the construction and arrangement of axles, axletrees, and the naves of wheels for carriages, consist in a novel mode of relieving the friction caused by the rubbing of the peripheries of the axles against the internal parts of the boxes or naves of wheels as they revolve. This is effected in the present improved construction and arrangement of axles, axletrees, and the naves of wheels for carriages, by introducing into recesses formed in the solid part of the axle, certain cylindrical anti-friction rollers, the peripheries of which rollers are intended to meet the internal surface of the box or nave of the wheel, and as it revolves, to relieve the friction which would otherwise occur from the rubbing of the surfaces of the axle and the box against each other.

Plate IV., fig. 3, represents the axle A, and the box or nave B, B, B, cut through in tranverse section; C, C, C, are three cylindrical rollers, let into corresponding recesses, formed in the solid part of the axle A. Fig. 4, is a longitudinal section of the axle A, and of the box or nave B, B, shewing one of the cylindrical anti-friction rollers C, in its place within the recess formed in the axle. Fig. 3, represents an external view of the axle A, the box B, being removed, in which two of the anti-friction rollers C, C, are partially seen. The ends of the rollers are reduced in their diameters for the purpose of turning in brass bearings, set in the recesses; and oil or other anti-attritious material may be introduced into the box of the wheel through an opening closed by a screw as shewn at D, in fig. 2. When the axle so furnished with the anti-friction rollers has been inserted into the box of the wheel, the cap plate E, E, sliding loosely upon the back part of the axle, may be affixed to the box B, by bolts and nuts, which will keep the wheel securely attached to the axle.

I do not intend to confine myself to any particular dimensions of the axle and box, as that must depend upon the required strength; nor to any precise number of anti-friction rollers, as that may be a matter of taste or convenience; but I claim the introduction of anti-friction rollers into the axle of the wheels, for the purpose of relieving the friction caused by the rubbing of the surfaces of the axle and box as the wheel goes round.—[*Inrolled in the Rolls Chapel Office, June,* 1839.]

Specification drawn by Messrs. Newton and Berry.

To OGLETHORPE WAKELIN BARRATT, *of Birmingham, in the county of Warwick, metal gilder, for his invention of certain improvements in the process of decomposing muriate of soda for the manufacture of mineral alkali and other valuable products.*—[Sealed 19th January, 1839.]

IN the common method of manufacturing sulphate of soda by decomposing muriate of soda or common salt with sulphuric acid and exposing the mixture to a strong heat in a furnace, muriatic acid gas is disengaged and is with difficulty condensed. Now the objects of these improvements in the said manufacture are the following:—Firstly, to effect the decomposition of the common salt without the application of heat and without the escape of muriatic acid gas, and which improvements are effected in the following manner:—

To about one hundred and thirty parts by weight of common salt dissolved in four hundred parts of water, add one hundred parts of concentrated sulphuric acid, and to this mixture put in sixty parts of metallic zinc in pieces of moderate size; on adding the zinc hydrogen gas is evolved or given off, which gas is to be collected in the usual way in any of the well-known apparatus for collecting and burning gases. The hydrogen gas so collected may be burnt and applied to the purposes of evaporation, or to any other purpose where light or heat is required.

When the zinc is dissolved, and time allowed for the sulphate of soda to form, or crystallize, draw off the clear supernatant solution, which contains chloride of zinc and a portion of sulphate of soda: then subject this solution to the action of heat, and by evaporation and cooling the remaining portion of sulphate of soda crystallizes, which is then added to the first crop. After this, wash the sulphate of soda in a hot saturated solution of common salt, which separates any chloride of zinc which may have remained mixed with the sulphate of soda.

In the above process it is evident that no heat is employed in the decomposition of the common salt, and that no muriatic gas escapes during such operation.

The object of a second process is to collect a portion of muriatic acid gas evolved from the mixture of muriate of soda and sulphuric acid when first brought together in a cold state, and then to finish off the charge or complete the decomposition of the salt and form the sulphate of soda by continuing or carrying out the process hereinbefore described. In this second process or operation an apparatus is employed suitable for the purpose—that known by the name of Woulfe's apparatus will answer very well.

To one hundred and thirty parts of common salt add one hundred parts of concentrated sulphuric acid. The vessel containing the salt and acid must be so constructed as to admit of the mixture being occasionally stirred with any convenient instrument or agitator, as a rake to facilitate the decomposition of the common salt; that portion of muriatic acid gas which is wished to be collected, being taken up by the water in the Woulfe's apparatus, in the form of liquid muriatic acid.

When muriatic acid gas ceases to evolve and before the vessels are unluted, add to the charge of salt and acid four hundred parts of water; then remove the vessels containing the liquid muriatic acid, and add to the charge sufficient zinc to complete the decomposition of the common salt.

The quantity of zinc required for this purpose will be found to be about one third less than in the first process.

The hydrogen gas evolved from the mixture or charge is to be collected and applied; then crystallize the sulphate of soda and proceed as already described.

The solution of chloride of zinc obtained in the above-described processes is to be decomposed by means of any convenient agent so as to separate the oxide of zinc. The patentee has found lime to answer this purpose with the greatest economy: sixty-four parts of zinc dissolved will require for this purpose about fifty-six parts of lime of the best quality and reduced to the state of cream of lime by slacking and mixing with water; but if after the addition of this proportion of lime the solution should by the well-known tests appear to contain excess of acid, more lime must be used till it ceases to do so.

The oxide of zinc thus precipitated is to be washed with a large quantity of water, to free it as perfectly as possible from chloride of calcium: it may then be used instead of metallic zinc for the purpose of decomposing fresh portions of common salt.

The patentee says he would remark, that the oxide precipitated from the solution of chloride of zinc, containing sixty-four parts of the metal, being used instead of the same quantity of metallic zinc, a little allowance should be made for the loss unavoidable in the process. Or the oxide may be employed as a pigment, or in the manufacture of glass, or for any other purpose to which it is applicable.

It will be evident that the native carbonate of zinc and also sulphate of zinc may be used instead of metallic zinc and the above-described oxide of zinc; but they have not been found to be so advantageous under common circumstances—still he claims their use as part of his invention.

The patentee says, in conclusion, "I wish it to be understood that I do not confine myself to the use of any particular apparatus hereinbefore mentioned; nor do I claim any privilege with respect to such apparatus, nor the preparation of the muriatic acid. And I do not claim lime as a precipitant of zinc, nor the producing hydrogen gas from the decomposition of water. But I claim as my invention the use and application of zinc in any form in the decomposition of common salt, and in the manufacture of sulphate of soda; I also claim as my invention the producing of hydrogen gas during the decomposition of muriate of soda; and lastly, I claim as my invention the chloride of zinc as produced during the decomposition of muriate of soda. And I would remark, that I do not intend to confine myself to the proportions here stated, as other proportions may be used, but not with such advantage."—[*Inrolled in the Rolls Chapel Office, July* 1839.]

To Miles Berry, *of the office for patents, Chancery-lane, in the county of Middlesex, patent agent and mechanical draftsman, for an invention of a new and improved method or process of alloying metals by cementation, particularly applicable to the preservation of copper, wrought or cast iron, and other metals; thereby operating a change in the appearance of their surfaces and giving them more brilliancy; being a communication made to him by a foreigner residing abroad.*—[Sealed 3d May, 1838.]

Alloying or changing of metals by cementation is a process well known in metallurgy, but I am not aware that any metal has ever been before so changed or protected by this process, that it could resist the action of air or humidity, or of certain acids; whereas, copper and iron, both wrought and cast, and other oxidizable metals, when they have been subjected to the said process, according as the same is modified to suit each particular description of metal, will be found to resist all these sources of oxidation.

And first, as regards copper, after it has been well cleansed, it is placed in a furnace, covered with a mixture of charcoal and powder of zinc, and the temperature then raised to cherry red, which degree of temperature is kept up for a longer or shorter period, according to the bulk of the article, or to the desired thickness of the coating and color to be given to the article. The operation is one of great nicety, for which I am informed no definite rules can be laid down, but, that experience will enable any competent workman to effect it with sufficient exactness. It will be found, that in every case, there is a point at which the copper when taken out of the furnace is perfectly inoxidizable, whereas, if the operation lasts too long, the product is nothing but common brass, very readily oxidized.

Second, with respect to iron: for the protection of this metal, two parts of zinc and three parts of copper are melted together in a crucible or any other suitable vessel, and into this mixture or alloy, the piece of iron after being well cleaned, is plunged. If bulky, the article is heated before it is dipped into the crucible, and the better to exclude the atmosphere, the zinc and copper bath is covered with a layer of salammoniac, or melted rosin, or borate of soda, or other suitable substance, preferring however, the salammoniac, which is found in practice to answer better than any other interposed medium.

The process thus described is occasionally reversed, that is to say, a boiling solution of the salammoniac or borate of soda is prepared and the iron dipped therein before immersing it in the zinc and copper bath; but I am not advised to recommend this process as preferable to the other.

The article being prepared by one or other of these methods, is put into a layer of charcoal powder in a furnace aud exposed to a strong red heat, until the fumes of zinc begin to abate. It is not well to wait until the vapours indicate no longer any zinc. The quicker the operation, the better is the result. The piece of iron must be taken out of the furnace still covered with charcoal, and in that state plunged into water or allowed to cool slowly.

A third modification of the process is as follows:—an alloy is made of zinc and copper in the proportions aforesaid, namely, two parts of zinc to three parts of copper, and when cooled it is put into a mortar with a quantity of borax and pulverized. The iron well scoured and cleaned is then smeared over with fat oil, grease or other unctuous substance, or merely wetted with water, and when thus prepared it is dipped into the zinc and copper powder, whence it is taken to be plunged into charcoal powder and subjected to a strong red heat as hereinbefore directed, until the fumes of zinc begin to abate.

A fourth variety of the process is to dip the iron into a solution of sulphate of copper, (after being perfectly cleaned), and to suffer it to remain there for a time. As soon as the iron is covered with a sufficient coating of precipitated copper, it is taken out, plastered over with potters' earth mixed with water, and then covered with a layer of pulverized zinc and borate of soda, or other substitute for the same; or the pulverized zinc and borate of soda or other substitute may be made into a paste, with the clay and water, and the article smeared over with the said paste. The iron is then placed in the furnace, covered with charcoal powder, and heated to white heat for some minutes. The rest of the process is the same as before described.

The metals thus rendered inoxidizable, are either of a gold or silver hue, according to the length of the operation or the quantity of zinc that combines with the copper. The brightness of the gold colored alloy may be enhanced by rubbing the article with vegetable charcoal, or the soot from a wood fire and nitric acid. It is proper to add, that instead of pulverized zinc, I have been informed pulverized calamine may be used.

And having now fully specified all that has been disclosed or is known to me of the said process, I declare that I claim as new the process of alloying by cementation as hereinbefore described in its several varieties, by which copper, iron, and other oxidizable metals are preserved from oxidation, their surfaces are changed in appearance, and also rendered more brilliant.—[*Inrolled in the Rolls Chapel Office, November*, 1838.]

To ORLANDO JONES, *of Rotherfield-street, Islington, in the county of Middlesex, accountant, for improvements in the manufacture of starch, and the converting of the refuse arising in or from such manufacture to divers useful purposes.*—[Sealed 27th February, 1839.]

THESE improvements in the manufacture of starch and in the converting of the refuse arising in or from such manufacture to divers useful purposes, consist in the following modes of operating:—

Firstly, I have discovered that the introduction of saccharine matter among the farinaceous materials employed in the manufacture of starch is beneficial in promoting the vinous fermentation; secondly, that the introduction of yeast or other ferments among the materials in such manufacture will also assist the vinous fermentation; and thirdly, that acetic acid may be usefully employed for dissolving and separating the gluten from the fecula in starch-making.

Though saccharine matters obtained from various substances would answer the purpose of my improved process, yet I prefer that obtained from the wash or refuse slime resulting from the manufacture of starch, which I prepare in the manner hereinafter described, and apply it with the meal, flour, or farinaceous material, whilst they are undergoing the steeping process. Yeast or other ferments may be added to the meal, flour, or other farinaceous materials, when steeping in the vat, the liquor being at a temperature of about 65° Fahrenheit. The acetous acid, in whatever way produced, I apply either by steeping the meal or flour in it in the first instance, which will supersede the necessity of a subsequent vinous fermentation; or it may be applied after the vinous fermentation has ceased, for the purpose of dissolving and separating the gluten from the meal, flour, or other farinaceous materials.

In order to convert the refuse wash or slime into saccharine matter or sweet liquor, I boil the said wash or slime with acid in the following proportions, or nearly so:—To any given quantity of the wash or slime, I add from one-twentieth to one fortieth by measure of the ordinary sulphuric acid of commerce, according to the state of the wash, which can only be known from observation. Such mixture I boil from two to four hours, dependent upon the strength of the acid and the state of the wash; and after this has been done, I introduce as much chalk or lime, or other suitable alkali, into the liquor as will neutralize the acid, and when settled, draw off the sweet liquor, which is then fit for use. Or I warm one hundred gallons of the before-mentioned wash or slime in a vessel to the temperature of from 76° to 86° Fahrenheit, and add to this from two to four bushels of finely-ground malt, and after well stirring it, raise the temperature of the mixture to 150° or 160° Fahrenheit. In this state it must continue from one to two hours, when the sweet liquor may be drawn off for use.

This saccharine matter or sweet liquor, thus obtained from the manufacture of the starch, I apply to promote the vinous fermentation in starch-making. Or the same may be fermented into distillers' wash, and subjected to the process of distillation for the production of alcohol; or it may be allowed to pass into the acetous fermentation, and be converted into vinegar.

Also, the top liquor resulting from the vinous fermentation of the meal, flour, or other farinaceous materials in the manufacture of starch, either in the improved or the ordinary mode, may, when the vinous fermentation has ceased, be drawn off for distillers' wash; or it may be allowed to pass into the acetous fermentation, and be converted into vinegar.

More particularly to describe my improvements in starch-making, without intending to confine myself precisely to the quantities of the materials used, I will say, for example, take four hundred gallons of water and add eighty gallons of sweet liquor, and warm the whole, and when at 65° F. stir in one hundred bushels of meal, flour, or other farinaceous materials; to this add from ten to fifteen gallons of yeast, or any other fermenting matter sufficient to set it in active fermentation; then stir it, that the whole may be equally fermented; and when the vinous fermentation has ceased, draw off the top liquor, from which may be extracted the spirit by distillation, and add four hundred gallons of strong acetic acid to the meal, flour, or other farinaceous materials remaining after the top liquor has been drawn off. Stir this occasionally for three or four days; then wash it through sieves into a receiver, using acetic acid or water for that purpose; it must then be allowed to deposit, and after drawing off the acetic acid, separate the slime or wash from the starch, which may be washed and finished in the usual way of starch-making.

Should the slime or wash still contain starch, add acetic acid, and well stir and allow it to deposit; after which, the slime or wash should be drawn off, and the starch finished as usual.

Or I may vary the process, by taking four hundred gallons of acetic acid, cold, or warmed to 65° Fahr., and add one hundred bushels of meal, flour, or other farinaceous material, and stir it well occasionally for two, three, or four days, after which it may be washed through sieves and finished as above. Again, I may vary the process by taking four hundred gallons of water, cold, or at 65° Fahr., and adding one hundred bushels of meal, flour, or other farinaceous material, and allowing it to remain till the vinous fermentation has ceased: then draw off the top liquor (from which may be extracted the spirit by distillation), and add to the meal, flour, or other farinaceous material remaining after the top liquor has been drawn off, four hundred gallons of acetic acid warmed to 65° Fahr., or cold, and stir it well together. After remaining from two to four days, I wash it through sieves and proceed as already described.

Having thus explained my improvements in the manufacture of starch, and in the converting of the refuse arising in or from such manufacture to divers useful purposes, in such a way as I think will be perfectly understood by starch-makers, I lastly declare, that the novelties which I claim to have invented in respect to such improvements are, firstly, the introduction of saccharine matter among the meal, flour, or other farinaceous materials employed in starch-making, to promote fermentation and expedite the process; secondly, the employment of yeast or other ferments for a similar purpose; thirdly, the use of acetic acid, to promote the acetic fermentation and to dissolve and separate the gluten in the process of starch-making; fourthly, converting the wash or slime obtained as a refuse product from starch-making to the purpose of producing a sweet liquor, which may be employed for the making of sugar and other uses, and particularly for promoting the vinous fermentation of the meal or flour in starch-making, or as a wash from which alcohol may be distilled; or it may be subjected to acetous fermentation, and converted into vinegar; and fifthly, the top water which is obtained from the vinous fermentation of the meal or flour, and the employment of the same as a distillers' wash for the production of alcohol, or for manufacturing acetic acid.—[*Inrolled in the Rolls Chapel Office, August* 1839.]

Specification drawn by Messrs. Newton and Berry.

Original Communication.

ON THE MEASUREMENT OF HEAT; IN REFERENCE TO THE QUALITIES OF COALS.

By Andrew Ure, M.D.F.R.S., &c.

(To the Editor of the London Journal and Repertory of Arts, &c.)

Sir,—An abstract merely of the following paper was read by me before the British Association for the Advancement of Science, at Birmingham:—

The production of a like calorific effect denotes the agency of a like quantity or power of heat. Thus for example, when a pound of iron at the temperature of 50°, passes by any means to 51°, it has received the same calorific influence, whether the heat proceeds from the sun or a common fire—whether from the immediate contact, or from the radiation of a hotter body. Thus also, a pound of ice at 32° F, requires always the same quantity of heat to melt it, whatever be the circumstances of its liquefaction; and a pound of water at 212° F, requires always the same quantity of heat to vaporize it, whether the evaporation be slow or rapid. On this fundamental principle, we can compare given quantities or powers of heat whenever we can apply them successively to produce the same effect; namely, to raise the temperature of a mass of matter, to liquefy a solid substance, or to vaporize a liquid. Since for this purpose, however, the heat must issue from the body in which it is contained, in order to pass into the body on which it is to operate a certain effect, it is evident that we can never compare the total or absolute quantities of caloric which bodies possess; for we can never exhaust all the caloric which they contain. Our measurement is restricted to those portions of heat merely which we can transfer from one body to another.

We say that a substance has more or less capacity for caloric, according as it requires more or less heat to suffer a given change of temperature, that of ten degrees of the thermometer for example: and this quantity of heat is called the *specific caloric* of the substance. Its capacity is said to be *constant*, when with equal weights, equal quantities of heat are required to raise its temperature one degree at any point whatever of the thermometric scale; that is to say, to make it pass from 50° to 51°, from 100° to 101°, from 150° to 151°, &c. It is highly probable, that all solid and liquid bodies have a progressively increasing capacity; thus a pound of iron requires more heat to pass from 100° to 101°, than from 40° to 41°; and still more from 200° to 201°. The ratio of its capacities for two given points of the scale, as 32° and 212° for example, is the ratio of the quantity of heat which it requires at each of these points to undergo equal changes of temperature. In general, the ratio of the capacities of two substances is merely the ratio of their specific heats,—that is to say, the ratio of the quantities of heat which they respectively take in like weights and at the same degree, to suffer equal changes of temperature. It is usual to refer the capacities of different bodies to that of water, called unity or 1.00000. Thus, if the heat which raises water one degree, raises oil two degrees, we say that the capacity of water is double that of oil; or, if that of water be 1.000, that of oil is 0.500.

By duly considering these definitions, we may readily comprehend the methods and instruments which have been employed to determine the capacities or the specific heats of different bodies.

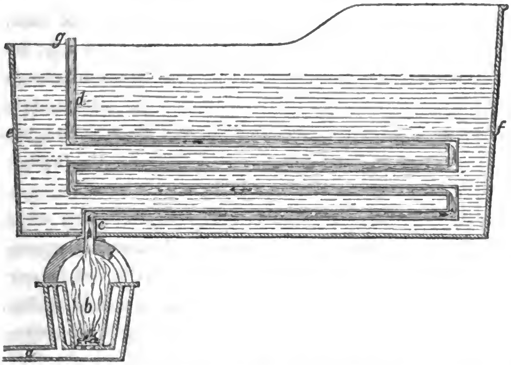
The first and most celebrated, though probably not the most accurate apparatus for measuring the quantity of heat transferable from a hotter to a colder body, was the CALORIMETER of Lavoisier and Laplace. It consisted of three concentric cylinders of tin plate, placed at certain distances asunder; the two outer interstitial spaces being filled with ice, while the innermost cylinder received the hot body, the subject of experiment. The quantity of water discharged from the middle space by the melting of the ice in it, served to measure the quantity of heat given out by the body in the central cylinder. A simpler and better instrument on this principle would be a hollow cylinder of ice of proper thickness, into whose interior the hot body would be introduced, and which would indicate by the quantity of water found melted within it, the quantity of heat absorbed by the ice. In this case, the errors occasioned by the retention of water among the fragments of ice packed into the cylindric cell of the tin calorimeter, will be avoided. One pound of water at 172° F, introduced into the hollow cylinder above described, melts exactly one poundof ice; and one pound of oil heated to 172° melts half a pound.

The method of refrigeration, contrived at first by Meyer, has been in modern times brought to great perfection by Dulong and Petit. It rests on the principle, that two surfaces of like size, and of equal radiating force, lose in like times the same quantity of heat when they are at the same temperature. Suppose for example, that a vessel of polished silver, of small size, and very thin in the metal, is successively filled with different pulverized substances, and that it be allowed to cool from the same elevation of temperature; the quantities of heat lost in the first instant of cooling will be always equal to each other; and if for one of the substances, the velocity of cooling is double of that for another, we may conclude that its capacity for heat is one half, when its weight is the same; since by losing the same quantity of heat, it sinks in temperature double the number of degrees.

The method of mixtures.—In this method, two bodies are always employed; a hot body which becomes cool, and a cold body, which becomes hot, in such manner that all the caloric which goes out of the former, is expended in heating the latter. Suppose for example, that we pour a pound of quicksilver at 212° F, into a pound of water at 32°; the quicksilver will cool and the water will heat, till the mixture by stirring acquires a common temperature. If this temperature were 122°, the water and mercury would have equal capacities, since the same quantity of heat would produce in an equal mass of these two substances, equal changes of temperature, viz., an elevation of 90° in the water and a depression of 90° in the mercury. But in reality, the mixture is found to have a temperature of only 37½°, shewing, that while the mercury loses 174½°, the water gains only

$5\frac{1}{2}^{\circ}$; two numbers in the ratio of about 32 to 1; whence it is concluded, that the capacity of mercury is $\frac{1}{32}$ of that of water. Corrections must be made for the influence of the vessel and for the heat dissipated during the time of the experiment.

The following calorimeter, founded upon the same principle as that of Count Rumford, but with certain improvements, may be considered as an equally correct instrument for measuring heat, with any of the preceding, but one of much more general application, since it can determine the quantity of heat disengaged in combustion, as well as the latent heat of steam and other vapours.



It consists of a large copper bath, *e*, *f*, capable of holding 100 gallons of water. It is traversed four times, backwards and forwards, in four different levels, by a zig-zag horizontal flue, or flat pipe *d*, *c*, nine inches broad and one deep, ending below in a round pipe at *c*, which passes through the bottom of the copper bath *e*, *f*, and receives there into it, the top of a small black lead furnace *b*. The annexed figure exhibits the structure of the calorimeter. The innermost crucible contains the fuel. It is surrounded at the distance of one inch, by a second crucible, which is enclosed in its turn by the sides of the outermost furnace; the strata of stagnant air between the crucibles serving to prevent the heat from being dissipated into the atmosphere round the body of the furnace. A pipe *a*, from a pair of cylinder double bellows, enters the ash-pit of the furnace at one side, and supplies a steady but gentle blast, to carry on the combustion, kindled at first by half an ounce of red-hot charcoal. So completely is the heat which is disengaged by the burning fuel absorbed by the water in the bath, that the air discharged at the top orifice *g*, has usually the same temperature as the atmosphere.

In the experiments made with former calorimeters of this kind, the combustion was maintained by the current or draft of a chimney, open at bottom, which carried off at the top orifice of the flue, a variable quantity of heat, very difficult to estimate.

When the object is to determine the latent heat of steam and other vapours, they may be introduced through a tube into the top orifice *g*, the latent heat being deduced from the elevation of temperature in the water of the bath, and the volume of vapour expended from the quantity of liquid discharged into a measure glass from the bottom outlet *c*. In this case, the furnace is of course removed.

In my researches subservient to the calorimeter, which are still in progress, the first point to which I direct my attention is, the proportion of volatile and fixed matter afforded by any kind of fuel, as pit-coal for example, when a given weight of it is subjected in a retort or covered crucible to a bright red heat. The result of this experiment shews to what degree the coal is a flaming or gas coal, and what quantity of coke it can produce.

The second point is the heating power of the fuel, as measured by the number of degrees of temperature which the combustion of one pound of it raises, 600 or 1000 pounds of water in the bath,—the copper substance of the vessel being taken into account. My experiments have been hitherto directed chiefly to a comparison of the heating powers of Welsh anthracite, Llangennoek coal, and a few other coals. I have found that the anthracite when burned in a peculiar way, with a certain small admixture of other coals, evolves a quantity of heat at least 35 per cent. more than the Llangennoek does, which latter is reckoned by many to be the best fuel for the purposes of steam navigation. One half pound of anthracite burned in the apparatus above described, heats 600 pounds of water ten degrees of Fahrenheit's thermometer, or from 62° to 72°, the temperature of the atmosphere being 66°. Thus, no fallacy is occasioned in the experiment by the conducting influence of the surrounding atmosphere, in either abstracting heat from the water or imparting heat to it. It hence appears, that one pound of anthracite will by its combustion cause 12,000 pounds of water to become 1° hotter. For the sake of brevity, we shall call this calorific energy 12,000 unities. In like circumstances, one pound of Llangennoek coal will yield by combustion 9000 unities of caloric. One pound of charcoal after exposure to the air gives out in burning 10,500 unities; but were it previously deprived of the moisture which it so greedily imbibes from the atmosphere, it would afford considerably more heat. One pound of Lambton's Wall's-end coals, affords 8500 unities.

It must be borne in mind that a coal which produces in its combustion, much carburetted hydrogen and water, does not afford so much heat as a coal equally rich in carbon, but of a less gasigenous nature; since in the production of the carburetted hydrogen, and the aqueous vapours, a great deal of heat is carried off in the latent state. I have no doubt, that by this distillatory process, from one-third to one-fourth of the total calorific effect of many coals is dissipated in the air. Hence those chemists, who with M. Berthier and Mr. Richardson, estimate the calorific agency of coals by the total quantity of carbon which they contain, have arrived at very erroneous conclusions, which become very manifest by burning highly hydrogenated coals in the calorimeter.

M. Berthier, with that view, seeks to determine the proportion of carbon in coals and other kinds of fuel, by igniting in a crucible a mixture of the carbonaceous matter with litharge, both finely comminuted, and observing the quantity of lead which is reduced. For every 34 parts of lead, he estimates 1 part of carbon, apparently on the principle, that when carbon is ignited in contact with abundance of litharge, it is converted into carbonic

acid. Each atom of the carbon is therefore supposed to seize two atoms of oxygen, for which it must decompose two atoms of litharge, and revive two atoms of lead. Calling the atom of carbon 6, and that of lead 104, we shall have the following ratio:—
$6 : \overline{104 \times 2} : : 1 : 34.66$, being Berthier's proportion.

On subjecting this theory to the touchstone of experiment, I have found it to be entirely fallacious. Having mixed very intimately 10 grains of recently calcined charcoal, with 1000 grains of litharge, both in fine powder, I placed the mixture in a crucible, which was so carefully covered, as to be protected from all fuliginous fumes, and exposed it to distinct ignition. No less than 603 grains of lead were obtained; whereas, by Berthier's rule, only 340 or 346.6 were possible. On igniting a mixture of 10 grains of pulverized anthracite from Merthyr Tydfil, with 500 grains of pure litharge, (previously fused and pulverized), I obtained 380 grains of metallic lead. In a second similar experiment with the same anthracite and litharge, I obtained 450 grains of lead; and in a third only 350 grains. It is therefore obvious that this method of Berthier's is altogether nugatory for ascertaining the quantity of carbon in coals, and is worse than useless for judging of the calorific qualities of different kinds of fuel.

In my researches upon coals, I have also made it one of my principal objects to determine the quantity of sulphur which they may contain; a point which has been hitherto very little investigated in this country at least, but which is of great consequence, not only in reference to their domestic combustion, but to their employment by manufacturers of iron and gas. That good iron cannot be produced with a sulphureous coal, however well coked, has been proved in France by a very costly experience. The presence of a notable proportion of sulphur in a gas coal, is most injurious to the gaseous products, because so much sulphuretted hydrogen is generated as to require an operose process of washing or purification, which impoverishes the gas, and impairs its illuminating powers by the abstraction of its olefiant gas, or bicarburetted hydrogen. In proof of this proposition, I have only to state the fact, that I found in a specimen of coal gas as delivered from the retorts of one of the metropolitan companies, no less than 18 per cent. of olefiant gas, while in the same gas, after being passed through the purifiers, there remained only 11 per cent. of that richly-illuminating gas. By using a gas-coal, nearly free from sulphur, such as No. 4, in the subjoined list, I think it probable that 10 per cent. of more light might be realized than with the common more sulphureous coal. This is an important circumstance which the directors of gas-works have hitherto neglected to investigate with analytical precision, though it is one upon which their success and profits mainly depend.

How little attention indeed has been bestowed upon the sulphureous impregnation of pit-coal, may be inferred from the fact that one of our professional chemists of note, in a public report, upon a great commercial enterprize, stated that a certain coal analyzed by him was free from sulphur, which coal I found by infallible chemical evidence to contain no less than 7 per cent. of sulphur, being about the double of what is contained in English coals of average quality. The proportion of sulphur may in general be inferred from the appearance and quantity of the ashes. If these be of a red or ochrey colour, and amount to above 10 per cent., we may be sure that the coal is eminently sulphureous. The coal above referred to afforded from 15 to 16 per cent. of ferruginous ashes. I believe that sulphur exists in coal always in the state of pyrites, either in manifest particles, or invisibly disseminated through their substance.

The readiest method of determining rigidly the quantity of sulphur in any compound, is to mix a given weight of it with a certain weight of carbonate of potassa, nitre, and common salt, each chemically pure, and to ignite the mixture in a platinum crucible. A whitish mass is obtained, in which all the sulphur has been converted into sulphate of potassa. By determining with nitrate of baryta, the amount of sulphuric acid produced, that of the sulphur becomes known. By means of this process applied to different samples of coals sent to me for analysis by one of the gas companies of the metropolis, and also by the Indian Steel Company at Chelsea, I obtained the following results :—

Gas Coals.	Sulphur in 100 parts.	Gas Coals.	Sulphur in 100 parts.
No. 1	3.00	No. 5	2.50
2	3.90	6	5.20
3	2.42	7	3.40
4	3.80	8	3.50

Coals for puddling cast iron, to be converted into steel.		Sulphur in 100 parts.
No. 1, hard foliated or splent coal, sp. grav.	1.258	0.80
2, ditto	1.290	0.96
3, ditto	1.273	3.10
4, cubical and rather soft	1.267	0.80

The last coal would prove an excellent one for the production of a pure coal gas.

The researches upon the calorific powers and sulphureous impregnation of our coals, are now in progress, and will, I hope, afford some interesting results for a future communication.

Copyrights of Designs

IN VARIOUS BRANCHES OF THE ARTS.

An Act to secure to Poprietors of Designs, for Articles of Manufacture, the Copyright of such Designs, for a limited time.—[Passed 14th June, 1839.]

The great importance of securing, by some sort of copyright, those ingenious productions of Art which cannot under the existing laws be made the subject of Royal Letters Patent, has for a long time engaged the attention of manufacturers, and has been much discussed in the pages of our Journal.

Several Acts of Parliament have been passed for the partial accomplishment of this object; but they extend only to the patterns employed for calico-printing, as under:—

27 *Geo.* 3. c. 38. (1787.)—An Act for the Encouragement of the Arts of designing and printing Linens, Cottons, Calicoes, and Muslins, by vesting the Properties thereof in the Designers, Printers, and Proprietors, for a limited time.

29 *Geo.* 3. c. 19. (1789.)—An Act for continuing an Act for the Encouragement of the Arts of designing and printing Linens, Cottons, Calicoes, and Muslins, by vesting the Properties thereof in the Designers, Printers, and Proprietors, for a limited time.

34 *Geo.* 3. c. 23. (1794.)—An Act for amending and making perpetual an Act for the Encouragement of the Arts of designing and printing Linens, Cottons, Calicoes, and Muslins, by vesting the Properties thereof in the Designers, Printers, and Proprietors, for a limited time.

2 *Vict.* (1839.)—Any Act passed during the present Session of Parliament, "for extending the Copyright of Designs for Calico Printing to Designs for printing other woven Fabrics."

The present Act affords protection to a great variety of designs in different branches of the arts and manufactures. Its provisions are as follows:—

"WHEREAS it is expedient that provision should be made for securing the exclusive benefit of designs for articles of manufacture to the authors and proprietors thereof for a limited time; be it therefore enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, That every proprietor of a new and original design made for any of the following purposes, and not published before the 1st day of July, 1839, shall have the sole right to use the same for any such purpose during the term of twelve calendar months, to be computed from the time of the same being registered according to this Act; and the following are the purposes referred to:—

"First—For the pattern or print to be either worked into or worked on, or printed on or painted on, any article of manufacture, being a tissue or textile fabric, except lace, and also except linens, cottons, calicoes, muslins, and any other article within the meaning of the Acts mentioned in the schedule hereto annexed: Second—For the modelling, or the casting, or the embossment, or the chasing, or the engraving, or for any other kind of impression or ornament, on any article of manufacture, not being a tissue or textile fabric: Third—For the shape or configuration of any article of manufacture, except lace, and also except linens, cottons, calicoes, muslins, and any other article within the meaning of the Acts mentioned in the schedule hereto annexed:

"Provided always, that every proprietor of a new and original design made for the modelling, or the casting, or the embossment, or the chasing, or the engraving, or for any other kind of impression or ornament on any article of manufacture, being of any metal or mixed metals, shall have the sole right to use the same during the term of three years, to be computed from the time of the same being registered according to this Act; but no person shall be entitled to the benefit of this Act unless the design have before publication been registered according to this Act, and unless such person be registered according to this Act as the proprietor of the design, and unless after publication of the design every article of manufacture published by him, on which such design is used, have thereon the name of the first registered proprietor, and the number of the design in the register, and the date of the registration thereof: And the author of every such new and original design shall be considered the proprietor, unless he have executed the work on behalf of another person for a valuable consideration, in which case such person shall be considered the proprietor, and shall be entitled to be registered in the place of the author; and every person purchasing for a valuable consideration a new and original design, or the exclusive or the partial right to use the same for any one or more of the above-mentioned purposes, in relation to any one or more articles of manufacture, shall be considered as the proprietor of the design for all or any one or more of such purposes, as the case happens to be.

"II. And be it enacted, That every person purchasing a new and original design, may enter his title in the register hereby provided; and any writing purporting to be a transfer of such design, and signed by the proprietor thereof, shall operate as an effectual transfer; and the registrar shall, on request, and the production of such writing, insert the name of the new proprietor in the register; and the following may be the form of such transfer, and of such request to the registrar:

"*Form of Transfer and Authority to register.*

"'I *A. B.*, author [*or* proprietor] of Design Number having transferred my right thereto [*or if such transfer be partial*] so far as regards the making of [*describe the articles of manufacture with respect to which the right is transferred*] to *B. C.* of do hereby authorize you to insert his name on the Register of Designs accordingly.'

"*Form of Request to register.*

"'I *B. C.*, the person mentioned in the above transfer, do request you to register my name and property in the said design, according to the terms of such transfer.'

"III. And be it enacted, That during the existence of such exclusive or partial right no person shall either do or cause to be done any of the following acts in regard to a registered design, without the licence or consent in writing of the registered proprietor thereof; (that is to say,)

"No person shall use for the purposes aforesaid, or any of them, or print or work or copy, such registered design, or any original part thereof, on any article of manufacture, for sale:

"No person shall publish, or sell or expose to sale or barter, or in any other manner dispose of for profit, any article whereon such registered design or any original part thereof has been used, knowing that the proprietor of such design has not given his consent to the use thereof upon such article:

"No person shall adopt any such registered design on any article of manufacture for sale, either wholly or partially, by making any addition to any original part thereof, or by making any subtraction from any original part thereof:

"And if any person commit any such act, he shall for every offence forfeit a sum not less than five pounds and not exceeding thirty pounds, to the proprietor of the design in respect of which such offence has been committed.

"IV. And be it enacted, That the party injured by any such act may recover such penalty as follows:

"In *England*, either by an action of debt or on the case against the party offending, or by summary proceeding before two justices having jurisdiction where the party offending resides; and if the party injured proceed by such summary proceeding, any justice of the peace acting for the county, riding, division, city, or borough where the party offending resides, and not being concerned either in the sale or manufacture of the article of manufacture, or in the design to which such summary proceeding relates, may issue a summons requiring such party to appear on a day and at a time and place to be named in such summons, such time not being less than eight days from the date thereof; and every such summons shall be served on the party offending, either in person or at his usual place of abode; and either upon the appearance or upon the default to appear of the party offending, any two or more of such justices may proceed to the hearing of the complaint, and upon proof of the offence, either by the confession of the party offending, or upon the oath or affirmation of one or more credible witnesses, which such justices are hereby authorized to administer, may convict the offender in a penalty of not less than five pounds or more than thirty pounds, as aforesaid, for each offence, as to such justices doth seem fit; and if the amount of such penalty or of such penalties, and the costs attending the conviction, so assessed by such justices, be not forthwith paid, the amount of the penalty or of the penalties, and of the costs, together with the costs of the distress and sale, shall be levied by distress and sale of the goods and chattels of the offender wherever the same happen to be in England; and the justices before whom the party has been convicted, or, on proof of the conviction, any two justices acting for any county, riding, division, city, or borough in England, where goods and chattels of the person offending happen to be, may grant a warrant for such distress and sale; and the overplus, if any, shall be returned to the owner of the goods and chattels, on demand:

"In *Scotland*, either before the court of session, or by summary proceeding as aforesaid, before any two or more justices of the peace of the county or place where the offence was committed:

"In *Ireland*, either by action in a superior court of law at Dublin, or by civil bill in the civil bill court of the county or place where the offence was committed:

"And no action or other proceeding for any offence under this Act shall be brought after the expiration of six calendar months from the commission of the offence; and in such action or other proceeding every plaintiff or prosecutor shall recover his full costs of suit, or of such other proceeding.

"V. For the purpose of registering designs for articles of manufacture, in order to obtain the protection of this Act, be it enacted, That the lords of the committee of privy council, for the consideration of all matters of trade and plantations, may appoint a person to be a registrar of designs for articles of manufacture, and if the lords of the said committee see fit, a deputy registrar, clerks, and other necessary officers and servants; and such registrar and deputy registrar shall hold their offices during the pleasure of the lords of the said committee; and the commissioners of the treasury may from time to time fix the salary or remuneration of such registrar, deputy registrar, clerks, officers, and servants; and, subject to the provisions of this Act, the lords of the said committee may make rules for regulating the execution of the duties of the office of the said registrar; and such registrar shall have a seal of office.

"VI. And be it enacted, That the said registrar shall not register any design unless he be furnished with three copies or drawings of such design, accompanied with the name and place of abode of the proprietor thereof; and the registrar shall register all such copies from time to time successively as they are received by him for that purpose, and on every such copy he shall affix a number corresponding to such succession, and he shall retain two copies, one of which he shall file in his office, and the other he shall hold at the disposition of the lords of the said committee, and the remaining copy he shall return to the person by whom the same has been forwarded to him; and in order to give ready access to the copies of designs so registered, he shall keep a classified index of such copies of designs.

"VII. And be it enacted, That upon any original design so registered, and upon every copy thereof received for the purpose of being registered, or for the purpose of such registration being certified thereon, the registrar shall certify under his hand that the design has been so registered, the date of such registration, and the name of the registered proprietor; and such certificate made on every such original design, or on such copy thereof, and purporting to be signed by the registrar or deputy registrar, and purporting to have the seal of office of such registrar affixed thereto, shall, in the absence of evidence to the contrary, be sufficient proof, as follows:

"Of the design, and of the name of the proprietor therein mentioned, having been duly registered; and of the commencement of the period of registry; and of the person named therein as proprietor being the proprietor; and of the originality of the design; and of the provisions of this Act, and of any rule under which the certificate appears to be made, having been complied with:

"And any such writing purporting to be such certificate shall (in the absence of evidence to the contrary) be received in evidence without proof of the handwriting of the signature thereto, or of the seal of office affixed thereto, or of the person signing the same being the registrar or deputy registrar.

"VIII. And be it enacted, That the commissioners of the treasury shall from time to time fix the fees to be paid for the services to be performed by the registrar, and such fees shall be applied to defray the expenses of the said office, and the salaries or other remuneration of the said registrar, and of any other persons employed under him, with the sanction of the commissioners of the treasury, in the execution of this Act, and the balance shall be carried to the consolidated fund of the United Kingdom, and be paid accordingly into the receipt of her majesty's exchequer at Westminster; and the commissioners of the treasury may regulate the manner in which such fees are to be received, and in which they are to be kept, and in which they are to be accounted for.

"And be it enacted, That if either the registrar or any person employed under him, either demand or receive any gratuity or reward, whether in money or otherwise, except the salary or remuneration authorized by the commissioners of the treasury, he shall forfeit for every such offence fifty pounds to any person suing for the same, by action of debt in the court of exchequer at Westminster, and he shall also be liable to be either suspended or dismissed from his office, and rendered incapable of holding any situation in the said office, as the lords of the treasury see fit.

"And for the purpose of facilitating the use of the provisions of this Act in regard to the registration of designs, be it enacted, That all letters and packets transmitted by post, either to or from the office of registrar of designs, relating solely to the business of such office, shall be exempt from postage; and that in respect of such letters and packets, the provisions of an Act passed in the first year of her present majesty's reign, intituled 'An Act for regulating the sending and receiving of Letters and Packets by the Post free from the Duty of Postage,' relating to the general regulation of the official privilege of franking, and to the transmission to the post-office of unprivileged letters, and the penalties and provisions mentioned in an Act passed in the first year of the reign of her present majesty, intituled 'An Act for consolidating the Laws relative to Offences against the Post-office of the United Kingdom, and for regulating the Judicial Administration of the Post-office Laws, and for explaining certain Terms and Expressions employed in those Laws,' shall, so far as the same may be applicable, apply to the office of registrar of designs, and the franking officer thereof.

"XI. And for the interpretation of this Act, be it enacted, That the following terms and expressions, so far as they are not repugnant to the context of this Act, shall be construed as follows; (that is to say,) the expression "commissioners of the treasury" shall mean the lord high treasurer for the time being, or the commissioners of her majesty's treasury for the time being, or any three or more of them; and the expression "article of manufacture" shall include any article of the kind herein referred to, whether it be made by hand or by machinery, or by both of those means; and the singular number shall include the plural number as well as the singular number; and the masculine gender shall include the feminine gender as well as the masculine gender.

"XII. And be it enacted, That this Act shall come into operation on the passing thereof, as to the office and the appointment of the registrar hereby authorized, and on the 1st day of July, 1839, as to the other parts of the Act.

"XIII. And be it enacted, That this Act may be amended or repealed by any Act to be passed in the present session of parliament."

The following is the Official Notice issued for the registering of Designs under the powers of the new Act:—

Office of Registry of Designs,
Wellington Street, North Strand, July 1839.

It having often been a subject of complaint that the designs of superior articles of manufacture were pirated, whereby the peculiar value of such articles was unjustly depreciated, and the art of design, in this respect, exposed to great discouragement, the President of the Board of Trade introduced a Bill into Parliament "for securing to Proprietors of Designs for articles of manufacture, the copyright of such designs for a limited time," which Bill became law on the 14th of June last, and came into full operation on the 1st instant. By this law a copyright in every registered design is given to the author or proprietor, for a term, in general, of twelve months, but sometimes, of three years. The Act extends to all designs for articles of manufacture (except such as are provided for under the Calico Printers' Acts,—27 Geo. 3, c. 38.—29 Geo. 3, c. 19.—34 Geo. 3, c. 23.—2 Vic. c. 13, and also lace,) whether such designs are made for any of the following purposes, that is to say:

1. For the pattern or print to be either worked in or worked on, or printed on, or painted on any article of manufacture being a tissue or textile fabric:

2. Or for the modelling, or the casting, or the embossment, or the chasing, or the engraving, or for any other kind of impression or ornament on any article of manufacture:

3. Or for the shape, or the configuration of any article of manufacture.

It is the application to the second class of purposes, in regard to any article of manufacture being of any metal or mixed metals, that a copyright of three years is given.

But the right given by this Act is subject to certain conditions, —the design must be registered—the proprietor of the design must be registered.—After publication of the design, every article of manufacture published by the proprietor, on which the design is used, must have thereon the name of the first registered proprietor, the number of the design in the Register, and the date of the registration. These conditions being observed, the right of the proprietor is protected from piracy by a penalty of from £5. to £30., which may be recovered by the aggrieved party either by action in the Superior Courts, or by summary proceeding before a magistrate.

In order to enable the parties to register, the Act empowers the Board of Trade to appoint a registrar, whose duty it is to register the designs on being furnished with three copies or drawings thereof—one to be filed—another to be placed at the disposal of the Board of Trade, and the third to be returned to the party registering. As evidence of the registration, the registrar is required by the Act to give a certificate, which is to be primâ facie proof of certain matters. The registration is to be subject to regulation by the Board of Trade, and the Treasury is required to fix the fees for registering, from which the expences of the office are to be defrayed.

All communications with the office, by the General Post, have the privilege of being sent free.

It should be understood that the privilege given by the Act is not confined to the authors of designs only, but if the design be executed by the author on behalf of another person, for a valuable consideration, the latter is entitled to be registered; and any person purchasing, for a valuable consideration, either the exclusive or the partial right to use the design, is equally entitled to be registered.

For the purpose of facilitating transfers, a short form of transfer is given. The object of the Act is the protection of the design apart from the articles of manufacture to which it is applied, and therefore the proprietor of the design may grant permission to use it, either with reference to all articles, or with reference to one article or more, and such permission being duly registered, the party to whom it is given will have to that extent the same right as the original proprietor, and be equally protected from piracy.

⁂ Any further information on the subject of the Registration of Designs in different branches of the Arts, may be obtained at Messrs. NEWTON and BERRY's Offices for Patents, 66, Chancery Lane, London, and Town Hall Buildings, Manchester, where instructions for registering such designs will be received, the fees and charges upon the transaction of which business, on an average, may be stated at £4. 4*s*.

Improvements in the Law of Patents.

An Act to amend an Act of the Fifth and Sixth Years of the Reign of King William the Fourth, intituled "An Act to amend the Law touching Letters Patent for Inventions."—[Passed 24th August, 1839.]

It will be remembered that in the case of Bodmer's application to the Privy Council for an extension of the term of his patents for spinning cotton, (the discussion on which is reported in vol. xiii. of our present Series, p. 175,) the Court found itself unable to entertain the application, as the petition had not been prosecuted with effect before the expiration of the terms of the several patents granted to Bodmer in England, Scotland, and Ireland. But Lord Brougham considered that the case of the applicant was one of extreme hardship, as he had been prevented from prosecuting his petition with effect in due time, owing to some malicious and groundless opposition, from which, by the letter of the law, the Court had not the power of relieving him.

In order, therefore, to prevent the recurrence of a similar case, the present Act has passed the legislature, which empowers the Privy Council to extend or prolong the term of any expired patent, provided the patentee, or his executors, administrators, or assigns, have petitioned in due form before the expiration of such patent right as may be sought to be prolonged.

"Whereas by an Act passed in the fifth and sixth years of the reign of his Majesty King William the Fourth, intituled 'An Act to amend the Law touching Letters Patent for Inventions,' it is amongst other things enacted, that if any person having obtained any letters patent, as therein mentioned, shall give notice as thereby required of his intention to apply to his majesty in council for a prolongation of his term of sole using and vending his invention, and shall petition his majesty in council to that effect, it shall be lawful for any person to enter a caveat at the council office, and if his majesty shall refer the consideration of such petition to the judicial committee of the privy council, and notice shall be first given to any person or persons who shall have entered such caveats, the petitioner shall be heard by his counsel and witnesses to prove his case, and the persons entering caveats shall likewise be heard by their counsel and witnesses, whereupon, and upon hearing and inquiry of the whole matter, the judicial committee may report to his majesty that a further extension of the term in the said letters patent shall be granted, not exceeding seven years, and his majesty is thereby authorized and empowered, if he shall think fit, to grant new letters patent for the said invention for a term not exceeding seven years after the expiration of the first term, any law, custom, or usage to the contrary notwithstanding; provided that no such extension shall be granted if the application by petition shall not be made and prosecuted with effect before the expiration of the term originally granted in such letters patent: And whereas it has happened since the passing of the said Act, and may again happen, that parties desirous of obtaining an extension of the term granted in letters patent of which they are possessed, and who may have presented a petition for such purposes in manner by the said recited Act directed, before the expiration of the said term, may nevertheless be prevented by causes over which they have no control from prosecuting with effect their application before the judicial committee of the privy council; and it is expedient therefore that the said judicial committee should have power, when under the circumstances of the case they shall see fit, to entertain such application, and to report thereon, according to the provisions of the said recited Act, notwithstanding that before the hearing of the case before them the terms of the letters patent sought to be renewed or extended may have expired: Be it therefore enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, That so much of the said recited Act as provides that no extension of the term of letters patent shall be granted as therein mentioned if the application by petition for such extension be not prosecuted with effect before the expiration of the term originally granted in such letters patent, shall be and the same is hereby repealed.

"II. And be it further enacted, That it shall be lawful for the judicial committee of the privy council, in all cases where it shall appear to them that any application for an extension of the term granted by any letters patent, the petition for which extension shall have been referred to them for their consideration, has not been prosecuted with effect before the expiration of the said term from any other causes than the neglect or default of the petitioner, to entertain such application, and to report thereon as by the said recited Act provided, notwithstanding the term originally granted in such letters patent may have expired before the hearing of such application; and it shall be lawful for her majesty, if she shall think fit, on the report of the said judicial committee recommending an extension of the term of such letters patent, to grant such extension, or to grant new letters patent for the invention or inventions specified in such original letters patent, for a term not exceeding seven years after the expiration of the term mentioned in the said original letters patent: Provided always, that no such extension or new letters patent shall be granted if a petition for the same shall not have been presented as by the said recited Act directed before the expiration of the term sought to be extended, nor in case of petitions presented after the 30th day of November, 1839, unless such petition shall be presented six calendar months at the least before the expiration of such term, nor in any case unless sufficient reason shall be shown to the satisfaction of the said judicial committee for the omission to prosecute with effect the said application by petition before the expiration of the said term.

"III. And be it further enacted, That this Act may be altered, amended, or repealed by any Act to be passed in the present session.

Novel Inventions.

DAGUERREOTYPE.

Few discoveries or inventions have created so much sensation in the scientific world as the recent invention of Mons. L. J. M. Daguerre, by which the images of all subjects received into the camera obscura, are rendered permanent.

That light or electricity, by some occult property, has the power of transmitting the fac-simile of a picture into a blank tablet, by the assistance of chemical agents, called photogenic drawing, has been long known; but it was reserved for the present day and the talented author of this discovery, to shew us that the image of a figure or of a landscape received into a camera obscura, could be spontaneously delineated by the action of light with the utmost accuracy and minutia, and fixed upon a tablet as a permanent picture.

Our present limits will not allow us to enter at large into the details of this extraordinary discovery or invention: it is the subject of a patent in this country granted, 14th August, to Mr. M. Berry, of the Office for Patents, Chancery Lane, London, in consequence of a communication made to him by a foreigner residing abroad, and in due time will be fully developed in its Specification.

Anxious, however, to give to our readers all the information that can with propriety be at present communicated, we subjoin a report of some public experiments performed by M. Daguerre in Paris :—

"M. Daguerre commenced a series of public experiments on his process for fixing images received by the camera obscura. The meeting was held at the Grand Hotel on the Quai d'Orsay, in which the Minister of the Interior had given orders to prepare a room for the purpose. About 120 persons were present, amongst whom were several distinguished *literati*, artists, &c.

" The object of the meeting was not to enter into all the details and scientific demonstrations connected with the *Daguerreotype*, but solely for the purpose of making a public experiment, and showing to each individual the exact manner of using the different parts of the apparatus, so as to arrive at the result already announced.

" M. Daguerre, upon whom the eyes of an anxious auditory were rivetted, took, in the first instance, a plate of copper plated with solid silver (not merely silvered); he rubbed it lightly with a little olive oil and finely-powdered pumice-stone, by means of small tufts of cotton. It is necessary to rub the plate, in the first instance, in a circular direction, and then in a straight line, so as to clean and polish the plate perfectly. This operation is to be recommenced with one part of nitric acid diluted with sixteen parts of distilled water, and repeated after slightly warming the plate (the plated surface upwards) by means of a lamp or a small heater placed underneath. The plate having gone through this process, is fit for receiving a layer of iodine, which layer is so peculiarly acted on by light that it will retain the image of objects subsequently striking upon it.

The plate fixed in a small board, and protected from the light, by closing the windows, was then placed (the plated part downwards) in the lid of a box, the bottom of which contained some iodine; the evaporation of the iodine towards the upper part of the box, produced in the course of 20 minutes a layer, the colour of which resembles that of yellow copper.

The experimentalist next took the plate so prepared, and fixed it in the camera obscura placed on the balcony of the room on the Quai d'Orsay. Alluding to the period of the season and the state of the sky he considered that it would require 20 minutes, so that the objects reflected upon the plate should become fixed to a sufficient degree. At other seasons of the year, when the sun was at a higher elevation, and possessed more force, from seven to eight minutes would suffice for producing the same result.

The plate was withdrawn without exhibiting any alteration, or any traces of a drawing or image whatsoever. The action of mercury, however, would in an instant bring into view the image which the assembly so anxiously looked for.

The plate was then placed in an inclined direction (of 45 degrees) in a new apparatus, the bottom of which contained about 2 lbs. of mercury, heated by means of a lamp to about 63 degrees of the centigrade thermometer. This temperature caused the particles of mercury to rise to the upper part of the apparatus, and these particles uniting on the plate, in a few minutes the drawing became apparent, as seen through a glass placed at the front of the box, a process which gave the spectator an opportunity of following, as if step by step, the formation of the drawing.

Thus the experiment was completed, to the great satisfaction of the assembly, and a unanimous burst of congratulation convinced the eminent inventor of the high sense entertained of this important discovery.

The only remaining part of the operation was to wash the plate with distilled water, saturated with salt or hypo-sulphate, and at a high temperature, but not boiling; after which this beautiful drawing, now unalterable by light, was handed round, and the company were enabled to admire a view, drawn with incredible precision, and representing the Quay, the Seine, and the Terrace and Palace of the Tuileries.

The above splendid result was obtained in an hour and some minutes, and it was clearly demonstrated that the operation relative to the layer of iodine, and that of fixing the image in the camera obscura, might be effected with much more rapidity under certain conditions.

It was evident to all present that any person familiar with the arts, and with physical and chemical experiments, might easily obtain the result expected from the Daguerreotype, which, moreover, requires but little skill and dexterity.

The satisfaction experienced by the assembly was enhanced by the assurance given by M. Daguerre—namely, that with respect to obtaining in the country the different apparatus connected with the above discovery, the plate could be prepared at home, and even the layer of iodine could be preserved in a closed box, protected from the light, for an hour, so that it would be possible to make use of it at a certain distance, merely by carrying the camera obscura. Four hours might thus be passed, without any trouble, previously to the operation of forming the layer of mercury, which might be deferred until the operator returned from his excursion. This assertion proves that the apparatus does not give so much trouble as was at first supposed.

Subsequently to this exhibition in Paris, some imperfect attempts have been made in London, to shew the invention, but not with satisfactory results; and in consequence of the invention being protected by a patent in England, it has been found necessary to have recourse to legal measures to prevent parties, who possess no interest in the patent, from *making, using, or vending* the apparatus or its results.

It is, however, expected that arrangements will very shortly be made with the proprietors of the Polytechnic Institution, in Regent Street, to permit Mr. Cooper, who has been in Paris for the purpose, to give public lectures at that Institution on this extraordinary discovery; and to shew, before the audience, the manner in which the camera obscura can be made to render all images, received into it, permanent pictures.

Scientific Adjudication.

Rolls Court, August 3d.

THE LONDON CAOUTCHOUC COMPANY *v.* BEDELLS AND BIGGS AND OTHERS.

This was a motion by the company to restrain the defendants from infringing their patent.

It appeared from the statement of Mr. Pemberton, who was counsel for the plaintiffs, that the company possessed a patent for a mode of application of India rubber, in the manufacturing of a certain description of cloth, &c., and the specification of the patent declared it to consist of three objects. The defendant Bedells had infringed the third object, which was the introduction of a spiral thread round the strands of Indian rubber used in weaving elastic webs.

Mr. Richards, who appeared for Mr. Bedells, said, that he had no objection to offer to the order of the Court restraining him from using the spiral thread—he had not known that his use of it infringed the plaintiff's patent until he received a notice to that effect, and he had immediately, on receiving such notice from the secretary of the Caoutchouc Company, abstained from using it, as it was unimportant to him.

The question as regarded the Messrs. Biggs, was different, inasmuch as it appeared that they were charged with having attached bands of India rubber web to the gloves manufactured by them, in which band was inserted strands of India rubber wound round by a spiral thread, which was a violation of the third object of the plaintiffs' patent; and that they had also violated the first object of the plaintiffs' patent, which was for an improved mode of introducing into the knitted fabric of gloves and other articles of hosiery, strands of India rubber, so as to form an elastic margin.

Mr. Richards, who was also counsel for the Messrs. Biggs, stated, that as to the third object, the use of the spiral thread, it was a matter of indifference to them whether the web they used contained it or not; indeed, they should prefer it without; but as to that portion of the application for the injunction which sought to restrain the defendants from manufacturing gloves according to the patent assigned to them (Messrs. Biggs), they would resist that. They insisted on their right to attach India rubber elastic web to gloves in the mode practised by them, so long as that web did not contain the spiral thread.

After some communications between the counsel and the attornies for all parties, it was arranged that an order should be made, that an injunction issue against defendants, restraining them from using bands to their gloves containing the strands of India rubber having the spiral thread; and pay 10*l.* to the company as the computed amount of profit on the web which had been attached to the gloves they had sold, and to those on hand. The company, on the other hand, admitting the right of Messrs. Biggs to attach the web to their gloves, and manufacturing them as they had done, but without the spiral thread.

DRAINING OF LAND BY STEAM POWER.

The drainage of land by steam-power, has been extensively adopted in the fens of Lincolnshire, Cambridgeshire, and Bedfordshire, and with immense advantage. A steam-engine of ten-horse power has been found sufficient to drain a district comprising 1000 acres of land, and the water can always be kept down to any given distance below the plants. If rain falls in excess, the water is thrown off by the engine; if the weather is dry, the sluices can be opened, and the water let in from the river. The engines are required to work four months out of the twelve, at intervals, varying with the season, where the districts are large; the expense of drainage by steam-power is about 2s. 6d. per acre. The first cost of the work varies with the different nature of the substrata, but generally it amounts to 20s. per acre for the machinery and buildings. An engine of forty-horse power, and scoop wheel for draining, and requisite buildings, costs about 4000*l.*, and is capable of draining 4000 acres of land. In many places in the fens land has been purchased at from 10*l.* to 20*l.* per acre, which has been so much improved by drainage as to be worth 60*l.* to 70*l.* per acre. The following list shows the number of steam-engines employed for this purpose in England:—Deeping Fen, near Spalding, Lincolnshire, containing 25,000 acres, is drained by two engines of eighty and sixty-horse power. March West Fen, in Cambridgeshire, containing 3600 acres, by one engine of forty-horse power. Misserton Moss, with Everton and Graingley Carrs, containing about 6000 acres effectually drained by one engine of forty-horse power Littleport Fen, near Ely, about 28,000 acres, drained by two steam-engines of thirty or forty-horse power each. Before steam was used there were seventy-five wind-engines in this district, a few of which are still retained. Middle Fen, near Soham, Cambridgeshire, about 7000 acres, drained by an engine of sixty-horse power. Water-beach Level, between Ely and Cambridgeshire, containing 5600 acres, by a steam-engine of sixty-horse power. Magdalen Fen, near Lynn in Norfolk, contains upwards of 4000 acres, and is completely drained by a steam-engine of forty-horse power. March Fen district, Cambridge, of 2700 acres, is kept in the finest possible state of drainage by a thirty-horse power engine. Feltwell Fen, near Brandon, 2400 acres, by an engine of twenty-horse power. Soham Mere, Cambridgeshire, formerly (as its name implies) a lake of 1600 acres, drained by a forty-horse power engine, the lift at this place being very great.—*Mining Journal.*

New Patents

SEALED IN ENGLAND.

1839.

To Charles Greenway, of Douglas, in the Isle of Man, for certain improvements in snuffers.—Sealed 5th September—6 months for inrolment.

To Bryan Donkin, of Blue Anchor-road, Bermondsey, engineer, for an improvement or improvements to be used in the process of making paper by hand or by machinery, being a communication.—Sealed 5th September—2 months for inrolment.

To Paul Robin, of St. Paul's Chain, London, gentleman, for improvements in spinning, being a communication.—Sealed 9th September.

To John Rapson, of Emmett-street, Poplar, millwright and engineer, for improvements in steering ships and vessels.—Sealed 9th September—6 months for inrolment.

To Frederick Brown, of Luton, in the county of Bedford, ironmonger, for improvements in stoves or fire-places. —Sealed 9th September—6 months for inrolment.

To Samuel Stocker, of High Holborn, pump maker, for improvements in beer, cyder, and spirit engines.—Sealed 11th September—6 months for inrolment.

To Moses Poole, of Lincoln's-inn, gentleman, for improvements in apparatus applicable to steam boilers, in order to render them more safe, being a communication.—Sealed 11th September—6 months for inrolment.

To Stephen Rogers, of the city of Bristol, merchant, for certain improvements in building the walls of houses and other edifices.—Sealed 16th September—6 months for inrolment.

To Isaac Dodds, of Masbro, and William Owen, of Rotheram, both in the county of York, civil engineers, for certain improvements applicable to railways, and in the construction and manufacture of wheels, engines, and machinery to be used thereon, part or parts of which are applicable to other engines, and which wheels without a flange, are also applicable for use and turnpike roads.—Sealed 16th September—6 months for inrolment.

To Job Taylor, of Pendleton, near Manchester, joiner, for certain improvements in machinery or apparatus for cutting or forming ornamental mouldings or devices in wood and other materials.—Sealed 19th September — 6 months for inrolment.

To William Newton, of Chancery-lane, for an improved machine or apparatus for weighing various kinds of articles or goods, being a communication.—Sealed 19th September —6 months for inrolment.

To John Wertheimer, of West-street, Finsbury-circus, printer, for improvements in producing ornamental raised surfaces on paper, being a communication.—Sealed 19th September—6 months for inrolment.

To Thomas Todd, of the borough of Kingston-upon-Hull, gentleman, for improvements in propelling vessels. —Sealed 19th September—6 months for inrolment.

To Henry Needham Scrope Shrapnell, of Gosport, in the county of Hants, gentleman, for improvements in cork-screws.—Sealed 26th September—6 months for inrolment.

To Samuel Wilks, of Darleston, Stafford, iron founder, for improvements in boxes and pins, or screws for vices and presses.—Sealed 26th September—6 months for inrolment.

To William Henry Hornby and William Kenworthy, both of Blackburn, Lancaster, manufacturers, for certain improvements in the machinery or apparatus for seizing and otherwise preparing cotton wool, flax, and other warps for weaving.—Sealed 26th September—6 months for inrolment.

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No. XCIII.

Recent Patents.

To Joseph Jones, *of Oldham, in the county palatine of Lancaster, cotton manufacturer, and* Thomas Mellodew, *of the same place, mechanic, for certain improvements in the construction of power looms, and in the manufacture of certain kinds of corded fustian or fabric, to be woven in diagonal cords from cotton wool, and other fibrous materials.*—[Sealed 16th June, 1834.]

The nature of our improvements consists in the adaption and arrangement of certain additional parts to an ordinary power loom, by which the motion of the heddles is so regulated and governed, that the cord or stripe, to be produced, on the face of a corded fustian or similar fabric, shall assume a diagonal direction across the piece, instead of forming lines parallel to the selvage, as in corded fustians of the ordinary construction.

Plate VI., fig. 1, represents a front view; fig. 2, a back view; and fig. 3, an end view of a power loom, to which our improvements are applied; and the remaining figures represent detached parts of the machinery or apparatus, which will be hereafter referred to.

In figs. 1 and 2, A, represents the fast and loose pullies through which the motion is given to the loom; B, in fig. 1, and 3, is the cloth beam, and C, the warp beam; and the general arrangement of the greater part of the loom is similar to ordinary looms, and well known to persons conversant with this description of machinery.

In looms for weaving corded fustians and similar fabrics, the nature, size, and proportion of the cord to be manufactured, mainly depends on the arrangement and action of the heddles which govern the position of the warp threads; and the size of cord to be manufactured is dependent on the amount of threads or ends which are elevated or depressed in the shed or opening in the warp, through which the shuttle passes. This shed or opening, or, in other words, the action or working of the heddles, which govern the position of the warp, has generally been effected by wipers or tappets placed on a shaft, driven according to the judgment of the mechanic constructing the loom, from the most convenient movement in the loom. The rotation of these tappets or wipers elevates or depresses a certain amount of the warp, according to the style and nature of the cord to be produced, and it is in the adaptation and arrangement of certain parts of machinery for producing a similar effect on the heddles, for the purpose of weaving diagonal cords, that our improvements in the construction of power looms consist.

The amount of warp threads or ends elevated or depressed, to form the shed or opening through which the shuttle has to pass, may be varied according to the number of wipers or tappets placed in the revolving shaft of an ordinary loom; but it is obvious that the amount of variations in which the warp may be placed, must depend and be limited to one single revolution of the shaft on which the wipers or tappets are placed, and this limitation it is the object of our invention to obviate.

We shall now proceed to describe the nature of our invention with reference to the annexed drawings, and shew how we are enabled to vary the position of the warp to a greater extent, in forming the shred, and thereby produce the diagonal cords in the fustians or similar fabric, to be manufactured.

In looms of our improved construction, or in such as our improvements are applied to, the rotary shaft or the wipers or tappets which govern the position of the heddles, is entirely done away with, and instead of the train of gearing which conveys motion from the driving shaft to the tappets, the driving shaft D, (as seen in fig. 2) is provided with a spur wheel *d*, which conveys motion through the carrier wheel d^1, to the spur wheel d^2, which is thereby caused to revolve once for every rotation of the driving shaft D, or stroke of the lay or slay, which is effected by a crank in the ordinary manner. On the axis of this last spur wheel d^2, is placed an excentric or scroll plate d^3, the form of which is best seen at fig. 3. This plate carries the small pulley or roller d^4, which is connected with the lever E, so that every rotation of the plate d^3, vibrates the lever E, on its fulcrum at *e*, which vibration is conveyed to a similar lever F, through the connecting bars *f*, *f*, and small lever f^1; and by tracing the motion of these parts it will be seen that the two levers E, and F, are thus caused to vibrate in opposite directions, once for every revolution of the plate ${}^3d$.

From the driving shaft D, motion is conveyed to the perpendicular shaft G, by means of bevel gearing, as best seen at figs. 2 and 3; and at the upper extremity of this shaft G, is placed a horizontal scroll, the rotation of which elevates the small lever *g*, (see fig. 2,) at every revolution, and thereby gathers a certain amount of teeth in the ratchet wheel H, by the catch or dog, as represented in the drawing; and the ratchet wheel H, is thereby forced forward a certain amount of its revolution, at every revolution of the shaft G. The letters *h*, *h*, represent an endless chain of peculiar construction, (as will be best seen in the separate fig. 6) which passes over an octagonal drum, placed on the same centre or shaft as the rachet H. This chain also passes over the guide pullies ${}^1h$, ${}^1h$, and the speed of the rachet H, is so arranged, that every revolution of the shaft G, moves the wheel H, one-eighth of a revolution, and thereby carries the endless chain *h*, *h*, forward one link or plate, which link or plate is made to correspond with the faces of the octagonal drum on the shaft of the wheel H, the form of which is shewn at fig. 7. From the shaft G, motion is conveyed to a small horizontal shaft I, best seen at fig. 3, on which are placed two tappets or wipers, the form of which is best seen at fig. 5, so that every revolution of the horizontal shaft I, traverses the part K, back and forth alternately, in the direction of the two arrows, seen at fig. 2; and this motion is imparted to one part of the chain *h*, *h*, which passes in the direction shewn at fig. 2; and the construction of this part of our invention is seen separately in plan, on an enlarged scale, at fig. 4. In this figure *i*, *i*, *i*, *i*, *i*, *i*, *i*, represents a series of small horizontal rods, which are arranged to correspond with the number of heddles required for weaving the diagonal cords; and the traverse of the part K, being made to correspond with the uniform movement of the chain *h*, *h*, either one or more of these horizontal pieces *i*, *i*, are forced forward at each traverse, according to the spaces or blanks placed in that link of the chain which is then presented opposite the part K.

L, L, figs. 1, and 2, represent the usual levers to which the various heddles are suspended, the opposite extremity of which is fastened by the bands *l*, *l*, to corresponding levers beneath the looms, in the usual manner; but at the position at which the bands *l*, *l*, would intersect the levers F, and E, (the vibrating motion of which has been already described) there is attached to each band *l*, *l*, the metallic hooked pieces, marked *m*, *m*, figs. 1, and 2, which is either forced on to the lever E, by the action of one of the small rods *i*, or carried under the lever F, by the tension of the band to which it is attached, or by a small spring arranged for that purpose. Thus the vibrating action of the levers F, and E, either elevate or depress a certain number of the heddles, according to the diagonal required in the corded fustian or fabric to be woven; and the amount of changes or variations of the various heddles is only limited by the number of links or plates of which the chain *h*, *h*, is constructed or composed, instead of being limited to the single revolution of the shaft which carries the wipers or tappets in the ordinary construction of looms for work of this nature.

Having described the nature of our improvements in the construction of power looms, and in the manufacture of certain kinds of corded fustians or fabrics to be woven in diagonal cords, together with the manner in which the same is to be performed and carried into effect,—we hereby declare, that we claim the arrangement and adaptation, as hereinbefore described, of an endless chain of plates or links, so constructed as to govern the position of the heddles for the purpose of weaving diagonal cords; but we do not otherwise claim any separate parts of the loom or machinery which we have mentioned,—we have referred to them merely to shew our invention as used, applied, and adapted to and with the looms now in common use.

It will also be seen, from the preceding description, that the nature and position or angle at which the diagonal cords are placed on the face of the fustians, or similar fabrics, manufactured from fibrous materials, and requiring to be afterwards cut, so as to raise a pile thereon, depends on the construction and arrangement of the chain *h*, *h*, as already described.

The effect produced in cords woven with an endless chain *h*, *h*, as hereinbefore described, is, that a greater number of picks or shoots of weft can be thrown before the chain presents the link which commenced the operation, and thereby produces a diagonal cord, the race of which may be afterwards cut, or opened and finished as other corded goods now are, the races of which run parallel to the selvage: and having effected, by the means hereinbefore described, the weaving of diagonal cords, which may subsequently be cut or opened,—we therefore also claim, as our invention, the manufacture of corded fustians or fabrics, woven in diagonal cords from cotton wool and other fibrous materials, which will admit of being so cut and finished.—[*Inrolled in the Inrollment Office, December*, 1834.]

Specification drawn by Mr. Nicholson.

To Joseph Davies, *of Nelson-square, in the county of Surrey, gentleman, for his invention of a composition for protecting wood from flame.*—[Sealed 13th August, 1838.]

My invention is a composition of the substances hereinafter mentioned, combined with glue or size, or other animal gelatinous matter in manner hereinafter stated. The substances used are slate, slate dust, stones, sand, clay, and earth; any of these substances may be used separately, or any or all of them may be used together. All articles made and consisting of any of these substances, such as earthenware or bricks, may be used, but I prefer slate or slate dust; and when I use clay or earth, I mix sand or slate dust with it, as I find a composition binds better when so mixed.

Before using any of the above substances which are not already in a state of powder, I reduce them to powder by grinding in a mill, or otherwise. I boil the substance or substances with the glue or size, or other animal gelatinous matter, in a boiler, pot, or pan, frequently stirring the composition until the whole becomes thoroughly amalgamated, and of a proper consistency for use. I find that the proportion of one-twentieth of the gelatinous matter to the quantity of the substance or substances used, produces the best and most effectual composition; but an inferior composition may be made with a less proportion of gelatinous matter.

I apply my composition to the wood with a trowel or other suitable instrument, in the same manner as common stucco or plaster, in such thickness as may be deemed necessary:—in ordinary cases, for ceilings and floorings, I make it from half an inch to an inch in thickness, and thinner in places less exposed to danger. The composition may be applied immediately in the state in which it is taken from the boiler, but if it is not required for immediate use, it should be suffered to cool and dry, and it should be again reduced to powder, by grinding or otherwise, before it is used; it is then to be mixed with water, as in making common mortar.

I do not claim the mode of applying the composition, but I claim as my invention, the above-mentioned composition, formed of the above-mentioned substances, combined with glue or size, or other animal gelatinous matter, in manner hereinbefore mentioned.—[*Inrolled in the Rolls Chapel Office, December*, 1838.]

To WILLIAM LUKYN, *of Lower Cowley House, near the City of Oxford, dentist, for his invention of certain improvements in applying and attaching artificial and natural teeth.*—[Sealed 29th January, 1839.]

MY invention of improvements in applying and attaching artificial and natural teeth consists, firstly, in adapting a spring or spring-catch to hold or retain artificial or natural teeth in their required situation in the mouth of the person using such teeth, which spring-catch or spring is adapted and applied either to the artificial tooth, or to the stump, or fang, or bone remaining in the jaw of the person using them, or to the metal plate or frame commonly used and applied for holding or carrying such teeth; and secondly, in an improved spring, fastening, or connection, or method of attaching the gold plates, or bone or ivory frame of artificial teeth of the upper and under jaw together. And, in order that my invention may be more clearly understood, I will first describe the ordinary method of attaching engrafted or pivoted teeth to the stump in the jaw.

Plate VII., fig. 1, represents the ordinary method of attaching such teeth. *a*, is the fang or stump remaining in the jaw-bone, and *b*, is the artificial tooth to be applied. Now in this method a gold pivot *c*, is used, which is screwed or otherwise fastened into the tooth, and a hole *d*, is drilled in the stump remaining in the jaw; a small quantity of fine silk is then bound round the pivot *c*, which is forcibly pressed or driven up the hole *d*, in the fang, into the position shewn in fig. 2.

The inconvenience arising from this mode of proceeding is very great; sometimes considerable pain is occasioned by the necessity there is of driving the pivot up the hole in the fang with sufficient force to make it remain there; and it will be found, that after wearing a tooth, attached in this manner, some time, the hole or socket in the fang will become enlarged, and the tooth will drop out. This method also allows disagreeable secretions to collect and become a source of annoyance, and sometimes the fang is broken during the operation of attaching or pivoting the tooth.

Now the object of my invention is to prevent these inconveniences; and, in order to effect this, I attach the teeth to the fangs, or to the metal plate, or bone frame, in such a manner that they may be removed, changed, or cleaned, and be again returned with facility to their proper position. I effect this object by means of *springs* or *spring-catches*, or *spring-fastenings*, as before mentioned, which may be either fixed to the stump, the tooth, the metal plate, or to the bone frame, as will be readily understood by dentists.

Fig. 3, represents the simplest form of one of the spring fastenings attached to an artificial tooth, the fang or part remaining in the jaw, and the tooth being shewn separate. Fig. 4, shews this construction and application of spring-fastening with the tooth attached to the fang.

Fig. 5, is a tooth attached to the fang by a double spring. Fig. 6, represents a tooth with a spring-catch fixed to it, which, when passed into the socket in the fang, prevents the tooth from being removed until a small catch, at the lower end of the spring, is pushed back.

Fig. 6, shews another kind of spring-fastening. In this the fang and tooth are shewn, both separate and in connection; and although the spring is represented as being attached to the tooth, yet it may be applied either to the fang, or to a metal plate, or frame. Fig. 7, represents a tooth attached to a gold plate by a single spring, similar to the one shewn in figs. 3, and 4.

It will be seen, in this instance, the spring is fixed to the gold plate, and the hole or socket for receiving the spring is made in the tooth. Fig. 8, is a similar mode of attaching a tooth to a gold plate. Fig. 9, is also a mode of attaching a tooth by means of a spring-catch. In this instance the spring bears against a small gold pin *e*, which is fixed in the tooth, and passes through it, as seen in figs. 9, and 10.

It must be understood, that in figs. 7, 8, 9, and 10, the springs are permanently fixed by soldering to the gold plate; but as they may be accidently broken off, and as such an accident might occur at some distance from any dentist's, and where it could not be very readily repaired, I have invented a contrivance, by means of which the wearer himself can replace a spring, should any become broken or injured.

Fig. 11, represents a section of a tooth attached to a gold plate by a spring-catch; but in this instance the spring-catch may be removed from the plate, if broken, and be replaced by another, as will be readily understood by reference to fig. 12, which represents the different parts detached. *a*, is the gold plate, having a socket *b*, formed on its under side, and the head of the spring-catch *c*, being inserted therein, it is steadily retained in its proper position by a small pin, which is passed through the socket and head of the spring-catch for that purpose.

The persons wearing these teeth may be supplied with several spring-catches *c*, so that, should they accidentally break one, the broken parts may be removed by withdrawing the pin that is passed through the socket, and a fresh spring substituted in its place.

This method of attaching or connecting the pivot to the plate or frame, may be applied to the common pivot, as seen in fig. 13.

In order that the second part of my invention, viz.:—the method of attaching the frames or plates of the upper and under jaw together, may be better understood, I will first explain the mode usually pursued to effect this object, and I will then describe my improvement.

In the ordinary method, the frame or plate on the upper and lower set of teeth, are connected together by spiral or helical springs, in the manner shewn in fig. 14, which represents the jaws with a set of teeth in a closed position; fig. 15, shews the jaws open.

It will be seen, that when the mouth is opened the springs become straightened; and it sometimes happens when the wearer opens the mouth to an extraordinary degree, the springs will have a tendency to collapse and bend the wrong way, (as is shewn by dots in the drawing) when the mouth is being closed again,—and the set of teeth will be forced out of their proper position.

Now, I remedy this and other inconveniences that may arise from the use of these springs, by attaching the upper and under jaw together by means of nearly quiescent spiral or helical springs, which are attached to the jaw or bone frame by connecting pieces or small levers.

Fig. 16, represents this method of connecting the jaws, the mouth being closed; and fig. 17, represents the same when the mouth is open. *a, a,* are the connecting pieces or levers referred to, which I prefer to be made of a slightly undulating curved form, as seen in the drawing; the under connecting piece or lever is kept in its position by a small staple *b*, or by means of two pins, studs, or stops. The connecting pieces or levers *a, a,* are attached to the bone or metal frame, in any convenient or proper way, as will be well understood by dentists; or they may be attached to the gum by any of my springs, spring-catches, or spring-fastenings, before described,—their other ends being attached to the spiral or helical spring.

In this adaptation of spiral or helical springs to connect the upper and under jaw together, it will be seen that the spring itself moves but very slightly, the motion of the lower jaw being transferred to the upper connecting piece or lever *a*, which turns upon the pivot *c*.

Having now described my invention, I wish it to be understood, that I do not claim any of the parts that have been before known and in use for applying or attaching teeth, nor do I confine myself to the metals or substances of which the springs or frames may be composed; but I claim, as the invention secured to me by the hereinbefore in part recited letters patent, firstly, the application, adaptation, and use of springs, or spring-catches, or spring-fastenings, to attach or connect artificial or natural teeth to the fang or stump, or to a metal or bone frame, as above described; and also the method of attaching the said springs, or spring-catches, or spring-fastenings, and also the common pivot, to the metal frame, as described in figs. 11, 12, and 13, by means of which the said springs, or spring-catches, or pivots, or parts thereof may, with facility, be removed and replaced by the wearer with new ones should they become broken; and secondly, I claim the method, hereinbefore described and set forth, of attaching or connecting the frames or plates of the upper and lower jaw together, by means of the connecting pieces or levers *a*, *a*, in conjunction with the springs *d*, *d*.—[*Inrolled in the Rolls Chapel Office, July* 1839.]

Specification drawn by Messrs. Newton and Berry.

To Thomas Robert Sewell, *of Carrington, in the county of Nottingham, lace manufacturer, for his invention of certain improvements in manufacturing white lead.*—[Sealed 14th July, 1838.]

My invention of improvements in manufacturing white lead consists in the four following particulars:—first, a peculiar mode of manufacturing an oxide of lead, which will be found more suitable for conversion into white lead than those oxides known in commerce under the names of litharge and massicot; second, the production of a superior quality of white lead, into the composition of which a larger proportion of metallic lead, or a smaller proportion of carbonic acid enters, than into an equal weight of carbonate of lead produced by the ordinary modes of precipitation; third, the employment of carbonic acid obtained in a state which is better adapted to the manufacture of white lead than that evolved in the combustion of charcoal, or other carbonaceous matters in atmospheric air; and fourth, a superior mode of operating in order to abstract from the white lead the matters with which it may be in a state of mixture at the time of its production.

The mode in which I manufacture the oxide of lead, forming the first head of my invention, is this:—I take the partially oxidized lead, obtained in the ordinary mode of making red lead, at that point of the process which immediately precedes its introduction into the oven to be converted into red lead. This preparation I have found to consist of a portion of metallic lead, protoxide of lead, and some red lead. I place these materials in an oven similarly constructed to those usually employed in the manufacturing red lead; in which oven, or other convenient receptacle, I submit it to a moderately red heat for about three or four hours. During this time it must be frequently stirred with an iron rake, or other suitable apparatus, in order to expose all the parts equally to the action of the heat. This process of heating, owing to the high temperature, instead of converting the materials into red lead, decomposes all the particles of the red lead, oxidizes the metallic lead, and brings the whole to the state of protoxide of lead, which is the substance required. Whilst the protoxide is in this highly heated state, it is to be expeditiously removed from the oven into a vessel, and closed up from the action of the atmosphere until cold, when it has become fit for use.

I have now two modes of effecting the second head of my invention, either of which I can employ. One of these modes is, by precipitating the white lead from solutions of oxide of lead, by means of alkali or alkalies, in combination with proper portions of carbonic acid: the other is by precipitating white lead from solutions of oxide of lead, by means of carbonic acid, obtained in manner hereinafter to be described, under the third head of my invention.

In order to precipitate white lead by the first mentioned method, I take a quantity of protoxide of lead, dissolved either in dilute nitric or acetic acid, which solution may be either in the state of dinitrate, trisnitrate, diacetate, or trisacetate of lead: the two latter I prefer; which being substances well known to chemists, need no further description. To any one of these I add potash, soda, or ammonia, (which I prefer to be in a state of solution) in quantity just sufficient to neutralize the acid of the solution of oxide, and which alkaline materials must be previously in combination with as much carbonic acid as will be sufficient to convert the oxide of lead into dicarbonate of lead; but not enough to convert that oxide into carbonate of lead.

To ensure a similar result when I employ the carbonic acid in the state described under the third head of my invention, I pass such carbonic acid through a mixture of oxide of lead, in a solution of acetic acid, or acetate of lead, or through a solution of diacetate of lead, or of triascetate of lead, or through a mixture of any of these materials,—and agitate the mixture during the passage of the gas, but stop the supply of carbonic acid in a very few minutes after the liquid arrives at such a state as would produce an acid reaction upon blue litmus paper, when dipped into it.

Under the third head of my invention, the carbonic acid which I employ, may be obtained from either of the five different combinations of materials about to be described.—First, one part of charcoal, coke-dust, or any other similar carbonaceous matters, with about seven parts of sulphate of lime, well ground, and intimately mixed together:—second, one part of charcoal, or coke-dust, &c., with about ten parts of sulphate of barytes, well ground and mixed as above:—third, one part of charcoal, &c., with about eight parts of sulphate of strontia, well ground and mixed:—fourth, three parts of charcoal, &c., with about fifty parts of carbonate of lime, and one hundred and twenty parts of sulphuret of lead, well ground and mixed.

Either of the above combinations of materials are to be placed in a retort of the same construction as those used for distilling coal in the ordinary production of illuminating gas. The retort being heated to a bright red must be continued at that temperature as long as any gas can be generated, and the gas conducted into an hydraulic main, kept constantly supplied with water, and thence into a gas-holder, from which it may be pumped, or otherwise forced through a vessel of water, and brought into contact with the materials about to be converted into white lead.

The fifth mode of producing carbonic acid gas is, by placing charcoal, or coke, or other similar carbonaceous matters, broken into small pieces, in an earthen retort, and when heated to a bright red, passing a current of steam through the materials in the retort, which will cause the steam to be decomposed, and carbonic acid gas to be produced, with small portions of other gases not injurious to the subsequent operation of making white lead. These gases are to be collected in a gas-holder, and applied in the manner before described.

The improved mode of washing white lead, which forms the fourth head of my invention, is effected under pressure, in an apparatus of the kind represented in the accompanying drawings.—(See plate VI.)

White lead is produced in various ways, but most frequently in a state of admixture with acids and other matters, which it is necessary to remove by washing in water previously to the white lead being dried and prepared for market. This operation of washing has to be repeated several times in large volumes of water, and when it is desired to recover the acids and other matters so washed away from the lead, the very great quantity of water which must be evaporated in concentrating the matters contained in the water renders the operation difficult and expensive. To obviate this inconvenience, I perform the washing of the lead under either pneumatic or hydrostatic pressure, by which means I am enabled to cleanse the lead effectually by a comparatively small quantity of water, and also to save much of the time usually required for the lead to subside.

Plate VI., fig. 8, represents, in transverse section, a strong cast iron vessel *a*, *a*, *a*, lined with copper to prevent the white lead coming in contact with the iron; and *b*, is a strong cover to be placed upon it, and fastened down by screws; *c*, being the receptacle in the vessel for the lead to be washed. Fig. 9, is a similar transverse section of the vessel with the lid attached, the vessel being, in this instance, shewn in an inverted position.

Fig. 10, is a longitudinal section of the vessel, mounted in a strong wooden frame; and fig. 11, is a similar section, in which the vessel is seen inverted, as it would be while the washing process was going on. A rebate is made round the vessel at *d, d,* for the reception of packing, in order to render the vessel tight when the lid is fixed upon it. A thick plate of copper *e, e,* perforated with holes, is attached to the lid. A portion of this plate is shewn, both in plan and vertical section, upon an enlargeds cale, at figs. 12, and 13.

It will be perceived that the holes are countersunk at that part which goes next the cover, and that such countersinking forms a communication with all the holes, and constitutes a shallow passage between the plate and the cover. Copper pipes or tubes *f, f, f,* are inserted into perforations through the cover, which pipes communicate with the shallow passage behind the plate *e,* and are for the purpose of carrying off the water filtered through the holes of the plate when the lead is under the operation of washing.

The vessel is supported in its frame by hollow axles *g,* and *h,* lined with copper. The axle *g,* is to be stopped by a plug *i,* when the apparatus is in action. The axle *h,* has a tube passed through it for the purpose of conducting a current of water from the pipe *l*; the pipe *l,* and tube *h,* being connected by a stuffing box *m,* and at the end of the tube there is a bent nozzle, which directs the current of water.

The vessel having being filled with the white lead, and the lid fixed on, as shewn in fig. 10, it must be turned over into the position represented at fig. 11, which may be done by means of a toothed wheel taking into a pinion turned by a winch, or by any other convenient means.

Water being now passed through the pipe *l,* by means of a force pump, will, by the nozzle *n,* be thrown upon the top of the white lead in the vessel, and be forced through the lead, and through a filtering material *o*, *o*, on the face of the plate *e*; and by means of the holes in the plate *e*, will rush, with great rapidity, into the shallow passage behind, and be discharged by the pipes *f*, *f*, *f*, out of the vessel. This current of water, through the white lead in the vessel, must be continued until the water is discharged in a pure state.

The white lead, by this operation, will be found to have been compressed into a compact state at the lower part of the vessel, it is now, therefore, only necessary to draw out the plug, and to discharge such portion of water as may remain upon the lead. The vessel is then to be turned over into its former position, shewn at fig. 10, and the shaft *p*, brought down and keyed to the cover; when, after withdrawing the holding screws, the lid may be raised by turning the screw-box *q*, which will cause the shaft *p*, to lift the lid up and allow the white lead to be removed from the vessel.

I would, lastly, observe that I do not intend to confine myself to the particular form or construction of vessel for washing, described above, as any other convenient form or construction may be employed, if capable of washing the white lead under pneumatic or hydrostatic pressure.—[*Inrolled in the Rolls Chapel Office, January*, 1839.]

Specification drawn by Messrs. Newton and Berry.

To WILLIAM WATSON, Junior, *of Leeds, in the county of York, manufacturing chemist, for certain improvements in the manufacture of materials used in the dyeing of blue and other colours.*—[Sealed 8th November, 1838.]

MY improvements, in the manufacture of materials used in the dyeing of blue and other colours, consist in certain processes of preparing indigo, in order to render it more applicable to the purposes of dyeing wool, cotton, silk, and other similar materials, either in the raw or manufactured state; and also in adapting such materials to the general demand of commerce and manufactures upon a large scale.

In order that the improvements may be more readily understood, I deem it necessary to describe one ordinary manner of operating upon indigo, to improve its colour, and make it more available for the purposes of dyeing, which has hitherto been as follows:—the indigo is ordinarily dissolved in sulphuric acid, and by filtering the solution, which has been previously diluted with water, the grosser and impure parts of the indigo are separated from the finer; to this filtered solution is afterwards added some salt or alkali, which precipitates the blue colouring matter in combination with the sulphuric acid; the precipitate being collected upon a filter, is now of the consistency of paste, and known in commerce as "extract of indigo."

The excess of uncombined acid which this produce contains, is sometimes, for still further improvement of the colour, and also for the convenience of dyers, removed by various operations, the details of which it is not necessary here to pursue.

Now my improvement in this process,—and in order to ensure the complete neutralization of the acid, thus rendering the colour more beautiful and pure, and securing the absence of all free uncombined acid,—is as follows:—I employ the hydrate of alumina in the manufacture of "extract of indigo," and in the following simple manner:—when the indigo has been dissolved in sulphuric acid, passed through the process already described, and the uncombined acid removed, as much as possible, by the ordinary means, I add to it hydrate of alumina or allum, and ammonia, potash, or soda, or any other materials, which, by their mutual decomposition, produce the hydrate of alumina; and, after mixing these well together, I place the mixture upon a filter, and allow it to remain until the paste is of sufficient consistency for sale or use.

Another method I employ, in order to improve the colour and quality of indigo to be used for dyeing, is lime, or orpiment and lime, or by other agents, by which indigo may be dissolved in *water*, such as potash, soda, or ammonia, fin-woad, &c.; and when such solution is made, it is allowed to remain at rest until the insoluble part of the indigo, and materials employed, have subsided; I then draw off the clear liquor, and, by exposing it to the action of the atmosphere, the blue colouring matter of the indigo is precipitated, which precipitate is to be collected upon a filter, mixed with diluted sulphuric, or muriatic, or any other acid, washed with water, and lastly dried; by which refining process I produce a beautiful and very pure indigo.

And also for a still further improvement of the colour of indigo, and for the more convenient use of it, I take indigo, refined by the process just described, and dissolve it in concentrated sulphuric acid, and this solution of refined or purified indigo, in sulphuric acid, I call *liquid* extract of indigo.

Lastly, I desire it to be understood, that I do not intend to claim such common or known processes as have been above alluded to, but the adaptation of such process or processes, upon a large scale, for the purpose of commerce and manufactures, and applying the product to the purposes of dyeing; and also the manufacture and application of liquid extract of indigo to the purposes of dyeing wool, woollen cloths, silk, cotton, or other goods, or materials.—[*Inrolled in the Rolls Chapel Office, May,* 1839.]

To William Watson, Junior, *of Leeds, in the county of York, manufacturing chemist, for an invention of certain improvements in the manufacture of liquid ammonia, by which the same may be made applicable to the purposes of dyeing, scouring, and other manufacturing processes.*—[Sealed 20th November, 1838.]

My improvements, in the manufacture of liquid ammonia, by which the same may be made applicable to the purposes of dyeing, scouring, and other manufacturing processes, consist in a more economical method of manufacturing it; but although I do not profess to make a pure solution of ammonia, I do make it pure enough for the purposes of dyeing, scouring, and other manufacturing processes: and again, although it is impure, it is entirely and distinctly a different thing from the impure solutions before used, and which are commonly called ammonia liquor, or gas liquor, or gas water; and also from such partially purified solutions of ammonia as are made from these for the purpose of making cudbear or archill, which, however applicable to such purposes, have not hitherto been used in the processes of dyeing and scouring: but, in order to specify distinctly the process or method which I have invented for the manufacture of liquid ammonia, or what is commonly called ammonia, it may be needful to state that the impure solutions of ammonia are obtained from the distillation of bones and other animal matter; and also from coal, in the making of coal gas; but in this state it is connected with so many other substances, such as oil, tar, carbonic acid, &c., as to render it quite inapplicable to any useful purpose.

In order, therefore, to separate the ammonia from its impurities, it has hitherto generally been the practice to combine it with sulphuric or muriatic acid, which, by evaporation, produces the salts of sulphate, or muriate of ammonia; and these salts are still further purified by exposure to heat, or by re-crystallization.

The impurities being thus removed, the ammoniacal salt is put into a retort or boiler, along with fresh slacked lime, and from this mixture is expelled a gaseous ammonia, which being passed into water is absorbed, and forms the liquid ammonia.

In this process, which I have invented, I manufacture the liquid ammonia from gas water, and I dispense entirely with the use of sulphuric or muriatic acid, and of course with the evaporation and crystallization. I make it in the following manner:—the gas liquor, or gas water, collected at coal gas works, I put into a retort, or any other suitable vessel, along with fresh slacked lime, the quantity of which is to be determined by the quality of the water, and, by the application of heat, a tolerably pure ammoniacal gas is disengaged, which, being passed into water, forms a solution of ammonia.

When this distillation has been carried so far, that a considerable portion of steam, or the vapour of water, proceeds from the retort along with the ammonia, the ammoniacal solution, already formed, is to be removed,—this I call the first portion; and what is collected afterwards by a continuation of the process, I call the second portion; and, being very impure, it is put back into the retort with the next charge of gas water.

The first portion must be again submitted to distillation, with or without a small quantity of lime, and the same precaution must be observed as before, that is, so long as the principal part of what proceeds from the retort or boiler is ammoniacal gas, it must be passed into water; and when this ceases to be the case, as by continuing the heat, the water as well as the ammonia will evaporate, which may be known by the pipes or worm that are connected with the retort, and through which the steam passes, becoming heated by the condensation of it,—the solution of ammonia, already formed, must be removed;—this may be called the first portion of the second distillation. The process may be continued then until all, or nearly all of the ammonia is distilled; this second portion is to be returned as before to the retort.

The first portion of this second distillation is a solution of ammonia, sufficiently pure for common purposes; but it may be still further purified by distilling it a third time in the same manner as before, preserving for use or sale that portion only which is made by the absorption of the ammoniacal gas (or what is principally ammoniacal gas) in water, and returning to the retort the latter portions of the process, which consist of ammonia and water that has been distilled from the retort, and brought along with them a considerable quantity of impurities.—[*Inrolled in the Rolls Chapel Office, May,* 1839.]

To FAUQUET DELARUE, Fils, *late of Deville, near Rouen, in the kingdom of France, but now of Manchester, in the county of Lancaster, calico printer, for certain improvements in the process of printing, or otherwise applying and fixing the colouring matter of madder upon cotton, silk, linen, and other fabrics, without dyeing; and producing, by these means, permanent colours.*—[Sealed 22nd November, 1838.]

MY improvements in the process of printing, or otherwise applying and fixing the colouring matter of madder upon cotton, silk, linen, and other fabrics, without dyeing, and producing, by these means, permanent colours, consist in the application of extract of madder and its various modifications to produce a fast red upon such fabrics, and mixed fabrics, made of all or any of the said substances.

The process for producing a fast red is partly chemical, and partly mechanical, and is as follows:—the extract of madder requires to be dissolved or mixed with some solvent or liquid.

After trying various solvents and liquids, I have found volatile alkali or ammonia to be the best. Although various other solvents may be employed, various extracts of madder will produce a red; but the one which I have found the best, is colorine.

I now proceed to specify the mode of mixing the colour for printing. I take one part extract of madder and an equal weight of ammonia, and allow them to remain in a close vessel for twelve hours; but the proportions of the substances and the time may be varied as experience will direct.—I only state the mode I have found best.

The mixture of extract and ammonia is then ground upon a stone or slab of marble, similar to that used by mixers of oil colours; and, during this operation, the thickening necessary for the printing of the colour by cylinder or block, should be added, and the grinding continued until the whole is thoroughly mixed. The thickening may be any of the various substances employed in colour making for printing, but I prefer gum serregal, or tragacanth; the quantity of thickening depends upon the design. In the same way the quantity of the solution of extract of madder depends upon the shade of red or pink required. I have used from four ounces to sixteen ounces per gallon; of course, other modes of combining the colouring matter with the thickening may be used, and mechanical means may be employed in place of manual labour.

The mode which I have stated is the most simple, and one which I have found to answer.

The colour, made as above, is ready for printing, and may be applied to the prepared cloths, in the usual way, by cylinder, flat press, block, or any other mode of application.

The pieces intended for printing with the above red colour, require to be bleached, and then prepared with any of the various mordants which produce a red when died with madder. I have generally used acetate of alumine, at 8° to 12°.

The pieces are to be padded with or passed through this liquor, and dried by any of the usual modes employed in printing of the various fabrics; then passed through a mixture of cow dung and water, at 150° of Fahrenheit. Water alone will answer, but I have found the common dunging operation used in calico printing, to produce the best result. Wash and dry, and the cloth is ready for the application of the colour.

The mode of preparation may be varied according to the different mordants employed; but the preparation above I have found to answer.

After the prepared cloth has been printed with the red colour, as before described, it must be exposed to the action of steam, by any of the various modes employed in printing calico, for such a period of time as may be found necessary.

I have used the common steam cylinders, perforated with holes, round which the pieces to be steamed are wound, the steam being admitted by the bottom of the cylinder; and I have generally steamed the pieces for thirty-five minutes, but the time and mode of steaming may be varied according to circumstances. After steaming, the pieces may be immediately washed off.

I have, however, where I have employed fixed alkalis in the mixing of the colour, passed the pieces through slightly acidulated water to neutralize the alkali.

The above is the process for the application of extract of madder to produce a fast red, which, when produced, may be treated in the same way as a common madder dyed red. For the purpose of brightening, or otherwise altering the shade, it may be soaped and passed through acids, or chloride of lime, or soda; but these operations must be regulated by the discretion of the operator, and according to the various colours which may be in combination with the patent colour.

Lastly, I desire it to be understood, I do not make any claim to the invention of the extract of madder, but simply to the application of the said extract to the cloth, by the process above described, and of which I am the inventor, which renders it a fast colour, and which has not hitherto been done.—[*Inrolled in the Rolls Chapel Office, May 22nd*, 1839.]

To Louis Cyprien Callet, *late of New York, in the United States of America, but now residing in Manchester, in the county of Lancaster, merchant, for certain improvements in machinery or apparatus for producing motive power, applicable to propelling boats and other vessels, carriages, machines, and other useful purposes; being a communication.*—[Sealed 11th July, 1838.]

These improvements in machinery or apparatus for producing motive power, applicable to propelling boats or other vessels, carriages, machines, and other useful purposes, consist in a novel arrangement of mechanism or apparatus for the purpose of communicating the power obtained from galvanism to cranks and driving shafts, in order to obtain a motive power, as such apparatus or machinery is designed to create or supply a power for any purposes to which animal, mechanical, or other physical force can be, or is applied to move bodies, and machinery of every description.

The apparatus is composed of a bolt or bolts, (hereinafter described,) and an instrument, denominated in science a helix, which is formed by winding insulated copper or other wire, proper for the purpose, spirally around a hollow cylinder, or other shaped tube of thin metal, or other suitable substance incapable of being magnetised, in the usual manner, and proper quantity, in making helices for the purpose of forming magnets. The wire is insulated by winding around the same cotton, silk, or other thread, or narrow stripes of cloth.

The helix, to increase its power, is to be inclosed (except the ends of it when placed in an upright position) in a case of cast iron, of equal thickness, and of such weight as will add most to the power of the helix. This case is in the shape of a hollow cylinder, open at each end, and fitting as closely as possible to the helix. Galvanism being passed through such wires, in proper quantity, the helix is complete. The helix should be so formed that the internal hollow will be smooth, firm, and uniform throughout, so as to permit a long and uniformly thick piece or bolt of iron of the same shape, and nearly exactly fitting the said hollow cylinder or tube to pass and repass longitudinally through it, with as little friction or obstruction as possible.

The end of a bolt or piece of iron fitting such hollow cylinder or tube, as before described, is then inserted a short distance into the hollow or tube, and the helix being galvanised, the bolt will be drawn forcibly entirely into the said tube, and a motion be thus created. The power and motion thus produced is made to effect a reciprocating action, and turn a crank or cranks, like the ordinary steam engine, by a machine constructed and put in motion as follows:—

In order that these improvements in machinery or apparatus, for producing motive power, may be better understood, I have attached to these presents a drawing of such apparatus, and marked similar letters of reference upon corresponding parts in each of the figures. (See Plate VII.)

Fig. 18, is a side elevation, and fig. 19, a plan or horizontal view of the apparatus.

Two of the above described instruments or machines consisting of a helix *a, a,* and bolt of iron *b, b,* each one placed perpendicularly, at a distance from each other, and so as to be directly under each extremity of a beam *c,* working upon a central bearing *d,* as the ordinary working beam of a steam engine. The top of each bolt *b,* is connected to the extremity of the working beam *c,* above, by a connecting rod *d*, d*,* which rod is united at one end to the bolt, and at the other to the extremity of the working beam by a suitable joint, so as to allow the bolts to move up and down perpendicularly, as the ends of the working beam rise and fall. The working beam is supported in the centre in proper bearings, so as to allow it to play freely up and down; the bolts being inserted when the working beam is horizontal, (or at half stroke,) so as to be a little less than half their length out of, and above, and a little more than half their length, within their respective tubes or helices. A rod of metal, *e,* is fixed by a swivel joint so as to allow it to play freely to the working beam, at a suitable distance between the centre of the beam and one of its extremities, according to the size of the crank it is to turn. The helices, *a*, *a*, are both supported firmly in a suitable frame, *f*, *f*, *f*, *f*, bolted to the ground or flooring. The rod *e*, before described, to turn the crank *g*, passes also through a mortice cut in the frame in order to let the rod play as the crank turns. The crank shaft, *h*, is supported in bearings attached to the framework of the apparatus: its two extremities are projected so as to extend beyond each side of the frames; upon one extremity outside of the frame is fixed an ordinary balance or fly wheel, *i*, *i*, of suitable size and weight; upon the other is fastened a small wooden cylinder or wheel, *j*, through the centre of which the crank shaft passes: upon this wooden wheel *j*, are fastened, on opposite sides of its periphery, at a small distance from each other, so as not to allow the galvanic fluid to be communicated from one to the other,—and one being on the inner and the other on the outer end of the said wheel, each extending about one half the length of said wheel,—two thin, smooth, flat pieces of silver, *k*, *k*, lying close to and inserted in the wood, and running about but not quite half-way around the wood, and forming semicircles, so that one and the inner half of the cylinder or wheel of wood presents a surface of wood, and the other or outer half presents a surface of silver.

Four long thin strips or bars of copper tin or silver, *l*, *l*, *l*, *l*, (silver being the best conductor) are then placed two on each side of the said wooden wheel, so that none of them shall directly communicate galvanism to any of the others, but so that the one end of each of those on one side shall rest and slightly press upon one of the pieces of silver on the wheel, and one end of each of those on the opposite side shall rest and press in the same manner on the other piece of silver on the wheel. The other ends of each of the inner strips or bars, *l*, *l*, *l*, *l*, are attached to the ends of the wires, *m*, *m*, or conductors leading to them, projecting from the upper ends of the helices, *a*, *a*; and the other ends of each of the outer straps are attached to conductors leading from the battery, and conveying the same kind of galvanism, that is either positive or negative, to both the said outer straps or bars. These conducting strips or bars of metal are firmly supported on pieces of wood, *n*, *n*, inserted into the sides of the framing on each side of the wooden wheel. The ends of the wires projecting from the lower ends of the helices under the frame, are united by extending a bar of copper, *o*, *o*, from one to the other, and to each end of which bar the lower ends of wire of each helix are soldered. A battery composed of a sheet of zinc and sheet of copper, or concentric alternate sheets of zinc and copper, such as is ordinarily used to galvanise helices in forming galvanic magnets, and sometimes called a calorometer, is then applied to the machine, placed in any convenient situation, as above described, by suitable copper conductors, one of which leads from the sheet or plate of zinc, and the other from the sheet or plate of copper composing the battery. One of these conductors is firmly secured by screws or other similar fastening to the copper bar, *o*, *o*, uniting the two lower ends of the helices; the other is forked or divided, or has two conductors attached to it, so as to lead the galvanism—but alternately, as hereinafter described—to the upper ends of the helices. Each of these conductors is attached to the ends of the outer strips or bars, *l*, *l*, of silver above described. The galvanism will then pass from the battery through the medium of the outer and inner strap or bar of silver on one side of the wooden wheel, and the plate of silver on the wheel, if they are in contact with it, to the helix on that side of the wheel; and it will pass in the same manner to the other helix when the strips of silver on the other side of the wheel are in contact with the other piece of silver on the wheel. The pieces of silver on the wheel must be so placed, that the ends of the strips of silver which are to come in contact with them, will commence such contact when the bolt on that end of the machine shall have reached its highest elevation in its helix. Galvanism being thus communicated to the machine, it will pass, through the medium of the two small silver conductors or straps, on one side of the wheel, which the position of said wheel brings in contact with one of the pieces of silver fixed upon it, as before described, to one of the helices; and that helix being thus galvanised, the bolt contained in it will be drawn or attracted downwards, so that its lower extremity will descend to the bottom of the helix; at the same time, the other two silver conductors or strips, on the other side of the wheel, not being in immediate contact with a piece of silver fixed on the wooden wheel, but with the surface of the wood itself, will form no communication for the galvanism from the battery to the other helix, and the bolt contained in it will rise so that its lower extremity will reach to a point about the third of a distance from the top of its helix, and which point or a point at about a third or quarter of the distance from the top of the helix, is the proper elevation for the lower extremity of either helix to rise to when at its highest point.

The apparatus or machinery being thus put in motion, and the crank made to revolve, the wooden wheel in its revolution will bring the other silver conductors or straps in contact with the other piece of silver on the wooden wheel, and suspend the contact of the other silver conductors or straps, with the other piece of silver, which latter conductors or straps will now rest on the wood. Thus, the helix not before galvanised, will become galvanised and draw down its bolt; and the helix previously galvanised, will cease to be so, and allow its bolt to ascend; and as soon as the wheel revolves, the helixes will thus be alternately galvanised and not galvanised, and the continuous alternate reciprocating motion of the two bolts be effected.

The crank being thus put in motion, will necessarily communicate driving power wherever it may be required, being attached by suitable gearing or otherwise. The power will be greatly increased in proportion to the dimensions of the helix and the battery, if, instead of only one helix and a single bolt at each end of the working beam, two helixes or a pair are used at each end, and standing so that their hollow cylinders shall be exactly parallel to each other. A stirrup-shaped piece of iron is then to be used to each pair of helixes, and formed as follows:—It should consist of two bolts of iron made to fit the hollows of the cylinders, as above described, and which bolts should be united at the top by a curved or straight piece of iron of sufficient thickness, (that is, about as thick as the bolts,) and which piece of iron should be nicely and firmly put on by mortices and tenons, or the bolts and top-piece may be drawn or formed in one piece. The bolts, however, must stand exactly parallel to each other, and so that they can be inserted into the two hollows of the two helixes or pair at each end of the working beam, and allowed to work freely in them. Each end of the working beam is to be attached by means of the connecting rod to the centre (between the bolts) of the cross piece of iron uniting the bolts, so that they will balance when suspended. The helixes are to be so placed that the top poles of each pair will be opposite poles when galvanism is passed through them: that is, the top of one helix will be positively magnetic, and that of the other negatively so. One battery will do for the four helixes, if they are so united that the galvanism will pass through the four, and the pairs be alternately galvanised. In this case, the helixes of each pair are to be united by soldering their top wires together. The bottom wires of two of the helixes on one side of the machine, but at opposite ends of the working beam, are to be united by the copper bar, as above described, having one of the conductors fastened to it by means of a screw or otherwise, as above described: the bottom wires of the other two helixes opposite to each other, and on the other side of the machine, are to be attached to the ends (opposite the ends resting on the wheel) of the inner straps or conducting bars of silver above described.

Lastly, I would remark, that the helixes employed in the above-described apparatus, may be made of copper, tin, or other suitable metal, cast or wrought in a spiral form (instead of wire). Various other modes may doubtless be contrived for letting on and suspending the passage of the galvanic fluid; and also two or more pair of helixes and cylinders may be coupled and arranged so as to actuate the same working beam or separate working beams moving the same shafts by rectangular cranks, so that the centre of motion may be more easily overcome, as in ordinary coupled steam-engines.

Having now particularly described the nature of the said invention, and the manner in which the same is to be performed, I wish it to be particularly understood that no part or parts of the above apparatus is claimed as new when separately considered; but I claim under the above-recited Letters the combination of the mechanism consisting of the helix and bolt or bar of iron or steel attracted and moving within the helix as above described, and thereby communicating motion to the rest of the apparatus, which is obviously not limited or confined to that shewn in the drawing.—[*Inrolled in the Rolls Chapel Office, January* 1839.]

Specification drawn by the Patentee.

To Christopher Nickels, *of York-road, Lambeth, in the county of Surry, manufacturer, for his improvements in the mode of manufacturiug of fabrics from linen, woollen, silk, and other fibrous materials.*—[Sealed 15th March, 1839.]

The patentee says that the fibrous materials, cotton, wool, silk, flax, &c. having been made into the forms of fabrics by various means, such as felting, weaving, platting, knitting and lacing, and the same having been rendered waterproof by saturating them with solutions of Indian rubber, he does not claim any of these as forming a part of his invention; but that his improvement consists in placing a series of the threads, yarns, or strands of any of those fibrous materials, parallel, side by side, in contact in one continued plane, and causing them to adhere together by coating their surfaces with solutions of caoutchouc (Indian rubber), shellac, or any other resinous matters, so as to produce a water-proof fabric.

The manner in which these threads, yarns, or strands of fibrous materials are to be spread out, so as to form a sheet, is not important; but in order to give the best information in his power, he describes one mode which he has found suited to the purpose.

He provides a large cylindrical drum of circumference and length equal to the dimensions of the sheet of fabric to be made; which drum being mounted upon an axle in suitable bearings, is enabled to revolve. A certain number of threads or yarns are then conducted from a series of bobbins or spools severally through the apertures of a reed, and their ends, in the first instance, made fast to the surface of the drum. The reed is affixed to a screw-box or nut, working upon a long horizon screw-shaft, placed parallel to and in front of the drum. The drum is then put into rotary motion, which, by revolving, draws the threads or yarns from the bobbins or spools through the reed, and winds them round its periphery, in parallel position, side by side.

As the drum revolves, some gearing wheels connected to its axle give rotary motion also to the long screw-shaft, which causes the reed to travel along the screw by a slow progressive movement, and thereby to guide the threads or yarns upon the periphery of the drum in helical curves, until the nut with the reed has arrived at the end of the screw, when the threads or yarns will be found to have completely covered or clothed the entire surface of the cylindrical drum, in a similar way to the spreading of a warp in a warping-mill.

This laying of the fibrous materials in a smooth surface upon or round the periphery of the drum, being effected, a solution of Indian rubber or other suitable resinous material, is then applied and spread over the surface of the yarns or threads so extended upon the drum; and in order that the solution may be laid evenly upon the threads, a scraper formed by a straight-edge is brought near to the surface of the drum, and as the drum revolves, the superfluous adhesive material is scraped off.

The fabric so produced is then allowed to dry upon the drum,—that is, the adhesive material is suffered to become set, or nearly so; when, if the fabric is not sufficiently thick, another layer of the threads or yarns may be wound upon the former in the way and by the machinery above described, and a further coating of the adhesive material may be put upon it in like manner; and when dry, the sheet must be removed from the surface of the drum, and will be found to be a water-proof fabric fit for use.

The patentee proposes, as a variety or modification of his invention, to cover the cylinder, in the first instance, with a woven fabric of cotton, wool, flax, or other material, and having wound upon this the threads or yarns in helical curves, side by side, as described, to coat the surface with the adhesive material, as before said, and then to place upon this, as an outer surface, a sheet of silk or any other fabric, and by that means to produce a water-proof fabric, having an ornamental or elegant face, for a superior sort of clothing, as for ladies' cloaks, scarfs, and other parts of garments.—[*Inrolled in the Inrolment Office, September* 1839.]

To George Cottam, *of Winsley-street, Oxford-street, in the county of Middlesex, engineer, for his invention of improvements in the construction of wheels for railways, and other carriages.*—Sealed 5th December, 1837.]

These improvements consist in a mode of affixing the iron spokes of railway carriages to their rims or felloes, by means of welding their ends to a flange or flanges formed on the inner circle of the felloe.

Plate VIII., fig. 8, represents part of a wheel in section, cut perpendicularly through the box or nave, and the felloe; *a*, is a section of the nave *b*, *b*, the spokes standing at an angle to each other, for the purpose of affording strength; *c*, is a section of the rim or felloe of the wheel. The spokes are to be placed in the angular position, shewn in the figure, and cast into the nave in the usual way, and the contracted ends of the two spokes being forked, are to be brought into contact with the inner flange or ring *d*, of the felloe, and then welded firmly together on to the ring or flange, by any convenient means.

Another modification of this plan of welding the spokes to the nave, is shewn at fig. 9, in which the felloe has two rings or flanges *d, d*. In this instance, the outer ends of the spokes are brought together and inserted into the groove formed by the two rings, and they are then welded firmly, so as to become fast to the felloe.

The patentee says, that for railway wheels, the felloe or rim may have its tyre heated and shrunk on, as is usually done.

An apparatus is also described for welding these wheels, in which the wheel is mounted on a vertical axle, and its radius made to extend over a forge on one side, and on to an anvil on the other, by which means, it may be very conveniently welded; but this apparatus is not to be considered as constituting any part of the invention.—*Inrolled in the Inrolment Office, June* 1838.

To Francis Hoard, *late of Demerara, but now of Liverpool, Esq., for improvements in making sugar.*—[Sealed 30th September, 1837.]

This invention consists in the application of a peculiar arrangement of boiling vessels for the boiling of cane, or other proper juice, in the process of making sugar therefrom, whereby considerable saving of fuel is effected, a constant circulation of the liquor, whilst boiling, is produced, and a facility of carrying on the process is obtained, as will be hereafter described.

Plate VII., fig. 20, is a perspective view of the apparatus or vessels, arranged or combined according to my invention; fig. 21, is a longitudinal section of the same; and fig. 22, is an end section taken transversely through fig. 21. In each of these figures the same letters indicate similar parts. *a, a,* is an oblong vessel, which is divided into five compartments A, B, C, D, and E, by the partitions *b, c, d,* and *e,* as is clearly shewn in the drawing. Through the lower part of the vessel *a, a,* is a flue *f, f,* through which the smoke and vapours from the furnace pass to the chimney, as will readily be traced on an examination of the drawing. *g, g, g,* are a series of tubes within the flue *f, f,* (or they may be a series of narrow chambers or vessels) in which the cane or other juice circulates from the bottom upwards, as is indicated by the arrows; by which means the same takes up the heat more effectually than according to the construction of teaches heretofore employed, for like purposes, in sugar making. The compartments A, B, of the vessel *a, a,* communicate, by means of pipes and cocks, with the compartment C; the compartment C, by a pipe and cock, communicates with the compartment D; and the compartment D, communicates, by a pipe and cock, with the compartment E; all which is clearly shewn in the drawing. F, is the furnace; G, a damper to the flue to regulate the draft.

Having thus explained the nature of the apparatus, I will now describe the mode of conducting the process, and in doing so I will suppose the apparatus to have been in work some time, and that the larger portion of the contents of the compartment A, has just been drawn into the compartment C. The compartment A, is to be again charged with cane or other juice from the boxes or clarifiers, and as the same boils, it is to be scummed, and the scum put into the trough *h, h,* around the vessel *a, a,* from whence the scum flows to the cistern. When the liquor, in the striking teach E, is in a condition to be removed, the cock *i,* is to be opened that the liquor may flow off to the coolers, which are situated at a lower level than the vessel *a, a*; and immediately the liquor has run as low as the cock *i*, that cock *i*, is to be shut, and the cock to the compartment D, E, opened, by which the liquor from D, will flow into E,—that cock is then to be closed, and the cock to the compartments C, D, is to be opened, and the liquor from C, will flow into D, when that cock is to be closed, and the cock to the compartments B, D, is to be opened, by which the liquor will flow into C,—that cock is then to be closed; such is to be continued until the liquor from B, will no longer flow therefrom; then a fresh supply of liquor is to be permitted to flow into the compartment B, from the boxes or clarifiers; hence it will be seen that the compartments A, B, alternately become the preparing vessels, and whilst one is being worked off the other is coming forward.

When the whole of the liquor, from the boxes or clarifiers, has been empted into the compartments A, B, and it becomes necessary to perform what is called boiling off,—when the liquor from any of the compartments becomes so low as not to flow by the cocks,—then a pump is to be used for pumping out the liquor from one compartment to the other; and in order to prevent burning the compartments, as they become empty of liquor, they are to be filled with water.

Having now described the nature of my invention, and the manner of working the same, I would remark, that although I have shewn the vessel *a, a*, of a particular shape, such as I consider to be the best adapted to carry out my invention, I would have it understood that I do not confine myself to the shape thereof, provided the general principle of the apparatus be retained. And I would have it understood that what I claim as my invention is, the application of an apparatus, such as is herein described, in the process of making of sugar, and particularly in the mode of producing a constant circulation of the liquor in such apparatus, as above described.—[*Inrolled in the Inrolment Office, March* 1838.]

To Alexander Gordon, *of the Strand, in the county of Middlesex, engineer, for certain improvements in the boilers or generators of steam or vapour, and in condensing such steam or vapour; and in engines, to be worked by steam or vapour, for propelling or actuating machinery and carriages on land, and boats, or vessels, or other floating bodies on water; being a communication made to him by a certain foreigner.*—[Sealed 21st February, 1833.]

This appears to be some further improvement upon an invention, relating to steam engines, for which a patent was taken, dated 28th September, 1831, in the name of Miles Berry, of the office for patents, Chancery-lane, London, in behalf of M. Galy Cazalat, of Versailles, in France.—(See vol. IX. of the second series of the London Journal of Arts, page 10.)

The present features of novelty apply, firstly, to the boiler; secondly, to the mode of condensing steam or other vapour; and thirdly, to the engine for driving or impelling vessels or carriages on land or water.

As respects the boiler, it is proposed to construct and combine several cylindrical boilers, to be placed erect, having vertical tubes passing through them for the passage of the heated air; which boilers are to be immersed in a vessel containing a strong solution of soda, in order that, by the superior capacity of the solution to receive and retain heat, the temperature of the water in the boilers may be always uniform, however much the intensity of the fire in the furnace may increase. To these boilers are also connected vessels which are to constitute reservoirs of steam, and the whole are furnished with suitable valves and connections, so that accidental explosions may be prevented, and any one or more of the boilers be disconnected from the rest in case of fracture or derangement.

It is proposed to employ, if desired, instead of steam, the elastic vapour of ether, or any other suitable material; and in that case the bath, surrounding the boiler, may contain water only, as its superior density to the latter will be sufficient.

The mode of condensing steam or other vapour after it has passed through the working cylinder, is proposed to be by bringing it into contact with metal surfaces, cooled by air or water, by which the vapour will be made to fall in a shower, and may, with a force pump, be reconducted into the boiler. This mode of condensing steam has been anticipated by several patentees.—(See Yandal's patent for cooling and heating fluid, vol. XIII., first series of our Journal, page 71.)

The third feature of the improvement applying to the engine, for driving or propelling, is the adaptation of rotary valves for supplying and cutting off the steam or other vapour. The construction of these valves is like the ordinary regulators of air furnaces or air stoves; two of them are to be worked simultaneously by pullies and an endless chain, actuated by some of the rotary parts of the engine; and by means of these two rotary valves the steam may be admitted to one of the working cylinders, whilst the supply is cut off from the other, and the steam is exerting itself expansively. The adaptation of the endless chain, for the working of both valves together, gives a uniformity of action to both pistons, and precludes any occasion for a balance fly wheel.—[*Inrolled in the Inrolment Office, August,* 1833.]

To David Stead, *of Great Winchester-street, in the city of London, merchant, for an improved mode or method of making or paving public streets and highways, and public and private roads, paths, courts, and bridges, with timber or wooden blocks.*—[Sealed 23rd April, 1839.]

This improvement is the fixing of wooden blocks in close contact, to form the pavings of streets and roads in place of stone.

The patentee proposes to employ blocks of pine or oak, cut into equal lengths, and to form their angular sides in regular figures, as squares, triangles, or hexagons, and to place their edges in close contact, the ends of the grain of the wood being upwards. They are to be bedded upon a firm ground, of any substantial material, so as to prevent their sinking.

If it should be deemed necessary, the blocks of wood may, after they have been cut to the desired form, be saturated with coal tar, or other chemical liquid, in order to preserve them; and when fixed upon the ground, being close against each other, the interstices, if any, between the blocks, may be filled up with bituminous cement.

The hexagonal figure is preferred by the patentee, as the edges or angles of the blocks, when so cut, will fit together most compactly and firmly; but if square, or any other angular shape should be adopted, it is necessary that the blocks should range diagonally across the street or road.

Blocks of wood have been before proposed, and partially used, for paving, (see vol. IX. of our first series, page 107,) but the patentee seems to consider his mode of fixing them as new, or an improvement upon what has been heretofore done. He makes no specific claim in his specification beyond the description above given.—[*Inrolled in the Inrolment Office, August*, 1839.]

To GEORGE SMITH, *of the Navy Club-house, Bond-street, in the county of Middlesex, a captain in her Majesty's Royal Navy, for certain improvements in vessels to be propelled by steam or other power, and in the construction and arrangement of the machinery for propelling.*—[Sealed 13th November, 1838.]

MY invention of certain improvements in vessels to be propelled by steam or other power, and in the construction and arrangement of the machinery for propelling, consists of two distinct parts or heads; the object of the first part or section being to render available, for a better purpose, certain parts of steam-vessels which are now but of little use, without doing away with their present employment; and consists in the application of boats to or for the covering of the ordinary paddle-wheel, and also to the forming the roofs or additional coverings over such cabins as are situated on each side of the ordinary paddle-boxes; which boats are to be properly fitted and applied to such situations, so that they shall form the roof or covering of the paddle-boxes, or an additional covering for the cabins, and at the same time be readily made available for use, as life or other boats, in case of danger, or other occasions. And the object of the second head or section of my improvements is, to apply or adapt certain descriptions of propellers in a better and more effectual manner than has been heretofore proposed, and consists in the peculiar arrangement, construction, and application of certain rotatory paddles or propellers, or propelling blades, to vessels, for the purpose of effecting their locomotion; by which improvements the propellers are rendered capable of being worked either by steam power, or by manual labour of the ship's crew, should the mechanical agent be out of order, or when thought desirable; the propellers being also so arranged and constructed that they may be removed from out of the water when sails are used to propel the vessel, and also that they shall be under water and out of the range of shots when in action. I will now refer to the accompanying drawings, the better to illustrate my improvements. (See Plate VIII.)

Fig. 1, is a partial transverse section of a paddle-box, shewing the ordinary paddle-wheel adapted to a vessel, and the first head of my invention applied thereto, which will be sufficient to explain how the same may be carried into effect when adapted to the roofs of the side cabins.

Fig. 2, is a partial plan view of the same.—*a, a,* represents the side of the vessel; *b,* the ordinary gangway; *c,* the shaft of the paddle-wheel; *d, e,* is the outer side-casing of the paddle; *f, f,* is the boat placed over the paddle-wheel, and secured thereon by proper fittings, or lashed with cords or chains, or fastened in any convenient manner, the upper part of the stationary or fixed casing being constructed to receive and retain the edges of the boat; and in order that the boat may be launched or lowered into the water with facility when required, levers *g, g,* are attached to the outer casing of the paddle-box by joints at *h, h;* which levers, while the boats form the covering of the paddle-wheels or the cabins, remain in the horizontal position shewn in the figure; but when the boats are required for use in the water, ropes or chains, *i, i,* fitted with proper tackle, are to be attached to the inner ends of the levers *g, g,* and passed over the staunchions or cranes, *k, k.* By these means the boats may be raised up edgewise until their edges are in a perpendicular position, when they may be let fall over the side until they arrive in the situation shewn by dots in figs. 1 and 2, where the levers *g,* may be retained by the chains *i,* and the boats lowered into the water by other ropes or chains, *l, l;* and, by the same means, they may be hauled up into their positions to form the covering of the paddle-boxes or cabins.

It will of course be understood that the boat, when applied to a paddle-wheel, should be constructed without thwarts or cross-pieces in the middle part, as these would come in the way of the paddle-wheel; but thwarts may be constructed to be applied and adapted after the boat has been raised from off the paddle-box, and when the boats are applied and adapted over the side-cabins, the thwarts may be attached to them in the same manner.

Fig. 3, is a vertical section of part of the stern of a vessel, shewing one of my improved modes of constructing, adapting, and applying rotatory blades or propellers thereto. The section is taken through the dead wood of the stern in a line with the keel.

Fig. 4, is a partial plan or horizontal view of the same.—*a, a,* is the dead wood of the stern of the vessel; *b, b,* is the propelling shaft leading from the steam-engine: upon this shaft is securely placed one set, *c,* of the rotatory propellers or blades, which revolve with it as their axle; the other set, *a,* are also mounted upon this shaft, but revolve freely upon it. The shafts and bosses of the wheels are to be fitted and adapted to revolve in proper bearings in the framework of the stern at *e, e.* Upon the boss of the blade *d,* is attached the bevil-wheel *f,* which takes into another toothed wheel, *g,* revolving upon a pin or stud, receiving its motion from another bevil-wheel, *h,* on the axis of the rotatory shaft *b.* By these means the two sets of propellers or blades are made to revolve in different directions and propel the vessel, their inclined sides forcing the vessel forward, as they move round, after the manner of a portion of a screw propeller, or the sculling movement of an oar.

In order that these propellers may be removed out of the water when not required to drive the vessel, the bearings at *e*, *e*, are furnished with cover or top pieces, *i*, *i*, moving in angular or other shaped grooves, *k*, *k*, and secured by keys or cottars, *l*, *l*, passed through part of the framework. When the propellers are required to be unshipped, these keys are to be taken out and the pieces *i*, removed, and the shaft or axle *b*, drawn back out of the bosses of the propellers, when the blades with their bosses may be taken out, and by the same means again applied when wanted. The axis *b*, is passed through a stuffing-box at *m*, to prevent water leaking into the ship; and in case the machinery or engine should get out of order, the shaft *b* is to be so constructed and connected thereto, that it may be readily disunited, and the propellers set in motion by bands, ropes, or chains, passed around the grooves *o*, *o*, in the wheels *f*, and *h*, and worked by means of the windlass belonging to the vessel, turned by the manual labour of the ship's crew. The modes of fitting and using such ropes or chains being easily understood, it is not necessary for me to describe them.

Fig. 5, is a representation of the stern of a vessel, shewing my improved manner of applying and adapting two sets of rotatory propellers or blades thereto, one on each side of the rudder.

Fig, 6, is a side-view of the same.—*a*, *a*, are the propellers; *b*, *b*, the shaft leading from the steam-engine or other first mover: *c*, is a stay or bar which may be used to carry an outer bearing to steady the shafts *b*, if thought necessary. It will be seen in this as well as the former application and arrangement of propellers, that in consequence of there being two sets, and they revolving in opposite directions, the action of the rudder of the vessel will not be affected by the water coming from the propellers, as is the case when only one set of such rotatory blades are used: and I would here remark, that the well-known screw propellers may be used in place of the blades, if thought desirable.

Fig. 7, is a partial sketch of one side of a steam-vessel, shewing the situation of three boats applied as described under the first head of my improvements.—*a*, is the boat placed as a covering over the ordinary paddle-wheel *b*; and *c*, *c*, are two other boats, placed over the side-cabins at *a*, *a*:—*e*, *e*, represents the situation of two sets of rotatory propellers, which may be thus applied and worked by shafts *f*, *f*, and may be used in case of the paddle-wheel being damaged, or the engine getting out of order or being stopped from want of fuel.—[*Inrolled in the Rolls Chapel Office, May* 1839.]

Specification drawn by Messrs. Newton and Berry.

To THOMAS LUND, *of Cornhill, in the city of London, cutler, for his invention of improvements in extracting corks from wine and other bottles, with steadiness, facility, and safety.*—[Sealed 3rd August, 1838.]

THERE are two distinct features in this invention;—the first is a frame, in which a bottle is to be placed, and held firmly whilst the cork is withdrawn by means of mechanism; the second is the adaptation, to a corkscrew, of a spring holder, which is to embrace the neck of the bottle.

Plate VIII., fig. 10, represents the frame and apparatus for drawing the cork, consisting of a bar of iron *a*, supported upon feet, so as to place it at such an inclination as shall not disturb the crust of the wine whilst the cork is drawing, nor allow the liquor to flow out when the cork has been withdrawn.

The bottle is placed upon a cradle *b*, lined or padded with soft material, as leather, which cradle is enabled to slide up and down the bar *a*, for the purpose of bringing the neck of the bottle to the collar *c*, of the corkscrew. The cradle *b*, is held in its adjusted position by a spring-catch *d*, taking into a rack at the under part of the plate *a*, which spring-catch may be withdrawn from the rack by depressing a thumb-piece, when the cradle *b*, may be slidden up or down.

The corkscrew, upon the principle of the well-known patent of Thomason, or of any other suitable construction, is mounted on a bracket arm *e*, and is turned by a winch *f*, so as to introduce the worm into the cork, and afterwards to draw out the cork in the way commonly practised.

Such an apparatus may be attached to a butler's table, in a pantry, or wine cellar; and a knife, having a brush in its handle, may be provided for cutting off the end of the cork and brushing it clear.

Fig. 11, represents an ordinary hand corkscrew, having steel springs *g*, attached to the lower part of the collar. In drawing a cork, these springs are first pressed on to the neck of the bottle, so as to embrace it, and cause the corkscrew to be firmly attached to the bottle.—*Inrolled in the Inrolment Office*, *February*, 1839.]

Original Communication.

(To the Editor of the London Journal and Repertory of Arts, &c.)

Sir,—The plan proposed to the Admiralty, by Mr. Tait, for constructing Harbours of Refuge on various parts of our coast is, I think, of too much national importance to be allowed to rest upon the already overloaded shelves of the Admiralty Office: I therefore avail myself of the medium of your Journal to communicate a sketch of the proposed plan, conceiving that to be the most effectual mode of bringing it under the notice of engineers and other practical men connected with the sea service.

In the accompanying sketch (see Plate VIII. fig. 12) of a plan of a Harbour of Refuge, partially isolated,—being a modification of Mr. Tait's "*Isolated Harbour*,"—he has designed not one, but three harbours, to all appearance. That in the centre is obviously for a temporary purpose, in so far as it has to act as a harbour. It seems to be a kind of interim or storm harbour;—"any port in a storm." Those on each side of it are excellently adapted to afford permanent and safe shelter, as well as to permit vessels to land and take in their cargoes. Even the *storm* harbour would admit of this convenience also, if wind and weather permitted.

There is no doubt that a harbour constructed on the above plan would not only be easy of access during almost any gale that can blow—with the exception of those only from the N. and N.W.—but must afford every requisite security to vessels taking refuge. I allude particularly to the two lateral harbours.

The prevailing wind appears to be supposed from the S.W., and the flood-tide to run in a S.W. and by W. direction. On carefully examining the above sketch, it is hardly possible to imagine a direction for the wind to blow from, which would produce any commotion within the two lateral harbours. There is just one point—and that is due E.—from which a tift of wind could be perceptible near the entrance only of the western harbour; and here it would be neutralized by impinging against the angle immediately opposite to its entrance.

The easy access to this harbour, by its spacious entrance and free and full admission of the sea into the outer or centre harbour, is a most important feature. The wave is not only received into it, but apparently welcomed, in all its fury, with all its sand and shingle to boot. The nearest and easiest course of the sea is here directly towards the shore, where, by a contraction of the channel and consequent acceleration of the current or wave, both the sea, and its load of shingle, (if any,) are carried, by a short course, round the north end of the east harbour. It must be unnecessary to add here, that before this powerfully accelerated current has expended its momentum, it will be joined by the natural current of sea from the S.S.W., which, co-operating with the artificial current, will be fully adequate to carry the shingle forward in its Eastern course. By this arrangement, Mr. Tait proposes to give the shingle the full advantage of the *ground swell*, and also of the *wind* and *wave*, which are said to have more influence on the movements of the shingle than even the tidal currents.—The tidal currents, however, do not appear to be overlooked in the present design. The eastern of these harbours is joined by a bridge of communication to the shore.

But in case the above plan should be considered too expensive for a nation, already *broken-backed*, with the support and maintenance of every kind of frivolity, (chiefly to serve the mere purposes of *political* parties,) and therefore with little left, to expend on the real and substantial *essentials* of the country, Mr. Tait has likewise designed another plan of a Harbour of Refuge, (fig. 13,)—adapted also to a shingle coast,—which, though not quite so capacious as that shewn in the former figure, (12,) is certainly much less expensive :—

It consists of an outer and *one* inner harbour. From the arrangements here adopted, it will be evident that no shingle can, by any possibility, get into the inner harbour; and the outer harbour, though arranged *purposely* to admit freely both the sea and the shingle, cannot retain any portion whatever of shingle, which might be thrown into it. The shingle readily finds its way shoreward, the shore being here left free and open to receive it, and so sloped off as to allow the shingle to travel obliquely, in its natural and usual course, eastward, with the flow of the tide.

The entrance to the harbour (fig. 13) is also fully open seaward,—so that in a storm no vessel can have the least difficulty (even at night with lights on the east and west piers) to make the outer harbour, ***in the first instance.*** Here she will find temporary protection, at least, under the lee of the overslapping and extended south-west breakwater. At all events, it cannot be doubted that she would be much safer here than buffeting about in the open sea, in a storm. From this outer harbour she can be towed, on the first opportunity, into the inner harbour, where not a breeze can enter to "ruffle the calm serenity of its surface."

The prevailing wind, current of the tide, and bearings, are all supposed to be similar to fig. 12.

The expense of a harbour similar to fig. 13, containing in its inner area about ten or twelve acres, and in its outer area about three or four acres, would not amount to an exorbitant sum, provided materials were nearly at hand, or at no great distance. The shore requires little or nothing to be done to it, further than a substantial abutment for the bridge of communication between it and the eastern pier. It is proposed that the centre pier should be of a good breadth, with a parapet running through the middle of it, to within about fifty feet of its outer extremity.

It will be observed that, generally speaking, the *inner* harbour, according to fig. 13, can be made almost of any extent. This is important.

I consider this a most suitable contrivance for a Harbour of Refuge, so much wanted, on the south-eastern shingle coast of England. If, for instance, the French were to adopt it, we should be sure to copy it from them immediately!

I am, Sir, yours, &c.

NAUTICUS.

***Walmer,* 10*th October,* 1839.**

DAGUERREOTYPE.

THIS extraordinary discovery, by which the pictures of all objects received into the camera obscura may, by the spontaneous operation of light, be rendered permanent, has very naturally excited great interest, particularly among artists and philosophers. But that interest, we regret to find, has not been limited to the mere admiration which an exhibition of such surprising philosophical effects must naturally call forth; it has raised up pretenders who have been long familiar with the fact, though they never promulgated it to the world, and now think it extremely illiberal that, in an age like this, the march of science should be interrupted by any claims of personal emolument for the discovery of a principle pre-existing in nature.

With these feelings, several attempts have been made by persons in no way connected with the inventor, or authorised by him or his representatives, to exhibit the Daguerreotype in London, in defiance of a Patent granted in this country to Mr. Miles Berry, before the invention was published in France; which attempts, though abortive in themselves and only calculated to bring the subject into contempt, have been reluctantly discontinued, from an apprehension of falling into the fangs of that grizzle phantom ycleped the LAW.

The consequence of such restraint imposed upon piratical attempts to invade the patent right of Mr. Berry, has been repeated threats to overturn the Patent, and a host of invectives against Patent Agents, who are presumed to look out for all useful discoveries made abroad, and immediately to appropriate such novelties to their own exclusive use and emolument by securing Patents for them in this country.

Such an impression must be extremely injurious to the parties against whom it is entertained, and necessarily strike at the root of that confidence which Patentees must of necessity repose in the judgment, integrity, and honour of their Agents. It therefore becomes an imperative duty to disabuse the public in this matter, and to state fully and unequivocally, that of all the Patents taken in this or other countries in the names of Messrs. NEWTON and BERRY, or either of them, or of any persons connected with their Offices in London or Manchester, in no one instance have they retained, or even considered that they ever possessed, any pecuniary interest in such Patent,—having in all cases merely represented the parties from whom the communications were made, and assigned the entire grant at the completion of their business as Agents.

These remarks have been called forth principally by letters received from Mr. Berry, who is at present in Paris on other business, and from which we make the following extracts, with copies of other letters to and from MM. Daguerre and Niepce, the parties interested in the English Patent taken in Mr. Berry's name:—

"This invention or discovery is not the creature of a day, but the result of many years' study, labour, and assiduity, patiently pursued by MM. Daguerre and Niepce; and when the desired result was obtained, the French Government purchased the right thereto in France for the benefit of their own people, giving the Inventors a proper remuneration for their discovery, and years of study and attention; and I am proud to do honour to the King of the French, the Government of France, and the scientific men who have fostered this invention and given it to that people. But in purchasing the invention for herself, France did not intend gratuitously to give it to England and the whole world.

"This erroneous idea seems to have taken possession of many of our countrymen, as well as foreigners. And why should France pay so large a remuneration as she has done to the proprietors of the Daguerreotype, for the empty honour of giving it to the people of England or any other nation? Yet the moment this beautiful discovery was made known in France, many individuals started from both countries, some from England, to learn the process, intending to use it for their own benefit,—and others from France, with an imperfect knowledge, to exhibit, and rob the Inventors of their just reward in our country. These individuals, finding that their anticipated harvest of plunder was stopped by the invention being patented in England previous to any exposition in France, turn round and shew their teeth, in spite of what they know is just and honourable towards the real authors and proprietors of this discovery.

" The facts are these :—The French Government, under the advice and direction of that worthy and eminent philosopher M. Arago, purchased the whole and sole right to exercise this invention of MM. Daguerre and Niepce, for the use of France and the French people; and these gentlemen, acting under the advice of their friends, took care to protect the discovery in England and Belgium,—and, I believe, elsewhere,—before they made any exposition of it to the French nation.

" Experience has shewn that these remarks are perfectly correct; for, beside others, we have had in London an attempted exhibition of this invention by a M. St. Croix, at the Adelaide Gallery of Practical Science, the proprietors of which, in defiance of legal proceedings commenced against them, have supported M. St. Croix in his piratical attempt. Without further observation on the injury this exhibition has done the invention, and the dishonourable manner in which the proprietors of that institution have acted, I will give you copies of some letters I have received in this business.

" Yours, &c.

" PARIS, 26th OCTOBER, 1839." " M. BERRY.

[*Translation.*]

" PARIS, OCTOBER 18th, 1839.

" SIR,—I consider it due to truth and to the Daguerreotype, which M. Sainte Croix injures considerably, to certify to you without loss of time, that this gentleman is totally unknown to me—that he left Paris before he knew how to execute the process, and, consequently, that the sketches he obtains can in no manner give an idea of the invention.

" I avail myself of the same opportunity of stating as a fact, that none of the sketches taken by me have been sold, and that, consequently, such sketches as have been offered for sale and represented as emanating from me, have been executed by other persons.

" I remain, Sir, with due regard, &c.

" DAGUERRE.

" Mr. MILES BERRY, Civil Engineer,
" *Of the Office for Patents, London.*"

Enclosed also is a letter from Mr. Pye, an artist of some note in London, with M. Daguerre's reply thereto:—

" OCTOBER 4th, 1839.
" 42, CIRENCESTER PLACE, FITZROY SQUARE,
" LONDON.

" To L. J. M. DAGUERRE, Esq.

" SIR,—The invention of Daguerreotype will, no doubt, link your name with those of the distinguished men who have conferred great benefits on your country; and the French Government, in rewarding you and giving your discovery to the civilized world, has so dignified itself by the act, that your invention and the Government of your country form, at this moment, the most interesting and pleasurable subject of conversation amongst men of art and science in London.

" Yet, whilst France is thus honored by you and its Government, Mr. Berry, an Englishman, announces by daily advertisements in the London newspapers, that he has taken out a Patent which gives to him exclusively the right of practising Daguerreotype in England, and that he is determined to prosecute all persons who may interfere with him by '*making, using, exercising, or vending it.*'

" There appears something so very extraordinary in the pretensions of Mr. Berry, (he having laid no claim on the ground of being the inventor, nor in right of any moral authority vested in him by you,) that there is growing amongst the admirers of your discovery in London, a determination to try by a Court of Law the value of those pretensions, and to publish the result in the French and English newspapers.

" Before taking that step which may lead to an Action, it is deemed well to request that you will have the goodness to inform me whether you (having sold your invention, and your Government having given it to the world) have vested in Mr. Berry, or any other Englishman, any exclusive right in it.

" Congratulating you on the very honorable distinction you have acquired, and trusting that the importance attached to your invention in England will be deemed an apology for the trouble this communication may occasion you, I await the favour of your reply, and remain, Sir,

"Your very obedient servant,

"JOHN PYE."

[*Translation.*]

"PARIS, OCTOBER 7, 1839.

"SIR,—In answer to your letter of the 4th instant, respecting the process of the Daguerreotype, and the Patent in England obtained for the same in the name of Mr. Miles Berry, Chancery Lane, previous to any exposition thereof in France, I beg to state that it is with my full concurrence that the Patent has been so obtained, and that Mr. Miles Berry has full authority to act as he thinks fit, under proper legal advice.

"I would add, that if you will take the trouble to read attentively the articles of agreement between me and the French Government, you will see that the process has been sold, not to the civilized world, but to the Government of France, for the benefit of my fellow-countrymen.

"With thanks for your good wishes and flattering letter, and esteem for your high talent as an artist, and with desire to have good will and assistance in England as well as in France,

"I remain, Sir,

"Your obedient servant,

"DAGUERRE.

"To Mr. JOHN PYE, London."

In further confirmation of what has been said above, we give the translation of a letter written to M. Niepce, by a Mr. A. Canning,—we believe, a Patent Agent,—who, on behalf of a Mr. Delianson Clark, also a Patent Agent, appears to threaten destruction to the Patent in England unless he is allowed to participate in its advantages:—

[*Translation.*]

"Paris, 5th October, 1839.
"24, Rue St. Lazare.

"To M. Niepce.

"Sir,—I received an answer from Mr. Delianson Clark, to whom I had communicated the proposals you said had been made to you.

"His letter, I must confess, is far from expressing satisfaction. Having in a frank and loyal manner desisted from an opposition to your application for an English Patent, and sacrificed the first steps he had taken,* he considered he had a right to expect you would eagerly avail yourself of his services, and that a community of interests would thus secure to you advantages you could hardly obtain but through his mediation. Therefore, hurt as he is at seeing his offers rejected, and disbelieving those made to you, he threatens to throw in your way obstacles which your interest, better understood, would induce you to avoid. He mentions to me the difficulties he intends raising against you; and knowing, as I do, his resources, his position in London, and the turn of his mind, I assure you I do not exaggerate either his dissatisfaction, or the means he has of proving it.

"Allow me therefore, Sir, to beg of you to pause before you take a decision, and to bear in mind that his dissatisfaction has a just cause, and that his co-operation may be as useful as his competition would be dangerous.

"I remain, Sir, with due regard, &c.
(Signed) "A. Canning."

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* We presume he was obliged to abandon a caveat he had entered to catch this invention, not being in possession of such information as would enable him to raise an opposition against the Attorney-general's Report on Mr. Berry's Petition for the Patent.

We have other letters upon the same subject, among which we find that a party who obtained a Patent here in May last, is about attempting to incorporate into his Specification the invention of MM. Daguerre and Niepce, though we have the most positive evidence that his invention in no one feature had any resemblance to the Daguerreotype, nor had any such idea entered his mind at the time he solicited his Patent.—Editor.

Scientific Adjudication.

MINERS' PATENT SAFETY FUSE.

DEVON ASSIZES, JULY 29.

Bickford and others v. *Skewes the Younger.*

This was an action for an infringement of the plaintiffs' sole right to the manufacture and sale of the "Miners' Patent Safety Fuse," the question being of considerable importance to the parties concerned.

Mr. Erle, Mr. Crowder, and Mr. Smith were for the plaintiffs; Mr. Sergeant Bompas and Mr. Butt, for the defendant.

The Safety Fuse is a kind of small rope, spun with a layer of gunpowder running through the centre, the outside being coated with pitch or tar, with whitening sprinkled over it to prevent its sticking to the hand. This fuse is used for blasting mines and rocks, and is a valuable invention, inasmuch as it obviates the dreadful accidents that frequently occurred by the old modes of blasting by the rush or quill. A beautifully executed model for manufacturing the fuse was placed on the table, from which the process was clearly explained to the Court and Jury. It was contended, on the part of the plaintiff, that he was the original inventor, and his patent, taken out in 1831, was proved. Evidence was then given, that, in 1837, a woman named Hosking left the factory of Messrs. Bickford, and went into the employ of defendant, who erected a machine resembling the plaintiffs', and manufactured an article imitating their fuse, which article he sold to the injury of the plaintiffs' rights: the plaintiffs' witnesses also deposed that they had never seen a fuse in use like Mr. Bickford's, before he introduced it.

The defendant alleged that Mr. Bickford was not the original inventor, but that the Safety Fuse was in public use before he took out his patent, and that he had not infringed the patent, as neither the machine, the materials of the fuse, or the fuse itself, were properly described in the patent, as required by law. The main question appeared to be, as to the invention and prior use of the article; the defendant's counsel, in the course of the examination, agreeing to admit that he had infringed the patent, so far as the manufacturing and selling a similar article went.

A number of witnesses were examined on both sides, but they did not bear out the Cornish motto of "one and all," as they told different stories.

The case was adjourned at the rising of the Court, and proceeded with on Tuesday. The examination of the defendant's witnesses occupied the Court till two o'clock; and at four o'clock the Jury returned their verdict for the plaintiffs—Damages One Shilling.

List of Patents

Granted for Scotland subsequent to 22d September, 1839.

Peter Lomas, of Bolton-le-Moors, Lancastershire, weaver, for certain improvements in looms for weaving.—Sealed 9th October, 1839.

Joseph Garnett, of Haslingden, same county, dyer, communicated by a foreigner, residing abroad, for certain improvements in machinery or apparatus for carding, drawing, roving, and spinning cotton, flax, wool, and other fibrous materials.—Sealed 9th October, 1839.

Joseph Daires, of Nelson-square, London, for a composition for protecting wood from flame.—Sealed 9th October, 1839.

Wilkinson Steele and Patrick Sanderson Steele, ironmongers, George-street, Edinburgh, for improvements in kitchen ranges for culinary purposes, and apparatus for raising the temperature of water in baths, and other uses.—Sealed 18th October, 1839.

William Edmonston and James Edmonston, both of Manchester, engineers, for certain improvements in the machinery or apparatus for the manufacture of wood screws and screw bolts.—Sealed 19th October, 1839.

Robert Stewart, of North Woodside, near Glasgow, for an improved crane for raising stones or other heavy substances from quarries or other works.—Sealed 22nd October, 1839.

Samuel Hall, of Basford, engineer, for improvements in steam engines and in propelling.—Sealed 22nd October, 1839.

New Patents

SEALED IN ENGLAND.

1839.

Joseph Clinton Robertson, of Peterborough Court, Fleet-street, for an improved method of manufacturing artificial marble, being a communication.—Sealed 27th September —6 months for inrolment.

Henry James Pedding, of Osnaburgh-street, Middlesex, artist, for improvements in collars for horses and other animals, being a communication.—Sealed 27th September —6 months for inrolment.

Francis Maceroni, of St. James's-square, Middlesex, gentleman, for improvements in steam boilers or generators.—Sealed 27th September—6 months for inrolment.

Thomas Robinson Williams, of Cheapside, gentleman, for certain improvements in the manufacture of flexible fibrous substances or compositions applicable to covering buildings, and other useful purposes, and also the machinery used therein.—Sealed 28th September—6 months for inrolment.

William Henry Burke, of Shoreditch, for improvements in the mode of constructing vessels for containing air, applicable to the purpose of raising sunken or lifting floating bodies under or in water, and of fastening such vessels to chains or other machinery or apparatus to be used for raising or lifting such bodies.—Sealed 3rd October —6 months for inrolment.

Job Cutler, of Lady Pool-lane, Sparbrook, Warwick, for certain improved combinations of metals to be used for various purposes.—Sealed 3rd October—6 months for inrolment.

Samuel Hall, of Basford, Nottingham, engineer, for improvements in machinery for propelling.—Sealed 7th October—6 months for inrolment.

Francis Gybbon Spilsbury, of Walsall, Staffordshire, chemist; Marie Francois Catherine Doetzer Corbaux, of Upper Norton-street, Middlesex; and Alexander Samuel Byrne, of Montague-square, gentleman, for improvements in paints, or pigments, and vehicles, and in modes of applying paints, pigments, and vehicles.—Sealed 7th October —6 months for inrolment.

John Lothian, of Edinburgh, geographer, for improvements in apparatus for measuring or ascertaining weights, strains, or pressure.—Sealed 10th October—6 months for inrolment.

John Barnet Humphreys, of Southampton, civil engineer, for certain improvements in shipping generally, and in steam vessels in particular; some of these improvements being individually novel, and some the result of novel application or combination of parts already known.—Sealed 10th October—6 months for inrolment.

James Smith, of Deanston Works, Kilmadock, Perth, cotton spinner, for a self-acting temple, applicable to looms for working fabrics, whether moved by hand or power.—Sealed 10th October—6 months for inrolment.

James Smith, of Deanston Works, Perth, cotton spinner, for certain improvements applicable to canal navigation.—Sealed 10th October—6 months for inrolment.

John Swain Worth, of Manchester, merchant, for improvements in rotary engines to be worked by steam and other fluids, such engines being also applicable for pumping water and other liquids.—Sealed 10th October—6 months for inrolment.

David Harcourt, of Birmingham, brass founder, for certain improvements in castors for furniture, and other purposes.—Sealed 10th October—6 months for inrolment.

Robert Edmund Morrice, of King William-street, London, gentleman, for improvements in the manufacture of boots and shoes, and coverings for the legs, being a communication from a foreigner, residing abroad.—Sealed 17th October—6 months for inrolment.

John Dickinson, of Bedford-row, Holborn, Middlesex, Esq., for certain improvements in the manufacture of paper.—Sealed 17th October—6 months for inrolment.

John Coope Haddan, of Bazing-place, Waterloo-road, civil engineer, and George Hawks, of Gateshead Iron Works, Durham, for certain improvements in the construction of wheels for carriages to be used on railways.—Sealed 17th October—6 months for inrolment.

James Yates, of Effingham Works, Rotherham, iron founder, for certain improvements in the construction of furnaces.—Sealed 19th October—6 months for inrolment.

Charles Rober, of Leadenhall-street, cloth manufacturer, for improvements in fixing colour in cloth.—Sealed 19th October—2 months for inrolment.

William Newton, of Chancery-lane, civil engineer, for certain improvements in machinery or apparatus for making or manufacturing screws; being a communication from a foreigner, residing abroad.—Sealed 24th October—6 months for inrolment.

James Sutcliffe, of Henry-street, Limerick, builder, for certain improvements in machinery or apparatus for raising and forcing water or other fluids, and increasing the power of water upon water-wheels and other machinery.—Sealed 24th October—6 months for inrolment.

George Graydon, of Sloane-street, Chelsea, for certain improvements in instruments, for which letters patent were formerly granted to him, and which were called therein, " A new compass for navigation and other purposes;" part of which improvements are applicable to instruments for measuring angles at sea, or on shore, by aid of reflection or refraction, or of reflection combined with refraction; and part are applicable to magnetic compasses for ascertaining true bearings from celestial observations, and for comparing the same with the bearing of the magnetic needle contained in such compasses, whereby to determine, and be enabled to allow for the deviation of such needle from the true meridian, whether by variation, local attraction, or other cause of error.—Sealed 24th October—6 months for inrolment.

CELESTIAL PHENOMENA, FOR NOVEMBER, 1839.

D.	H.	M.	
1			Clock after the sun, 16m. 15s.
	—		☽ rises 1h. 29m. M.
	—		☽ passes mer. 8h. 20m. M.
	—		☽ sets 2h. 53m. A.
2	14	53	♀ in conj. with the ☽ diff of dec. 0. 20. S.
	15	35	☿ in Aphelion
5			Clock after the sun, 16m. 15s.
	—		☽ rises 6h. 15m. M.
	—		☽ passes mer. 11h. 1m. M.
	—		☽ sets 3h. 37m. A.
	1	1	♃ in conj.with the ☽ diff. of dec. 5. 13. N.
6	3		☽ in Apogee
6	8	11	Ecliptic conj. or ● new moon
7	3	9	☿ in conj. with the ☽ diff. of dec. 3. 25. N.
8	3	34	♄ in conj.with the ☽ diff. of dec. 6. 35. N.
9	14	36	♂ in conj.with the ☽ diff. of dec. 3. 41. N.
	14	56	☿ in conj.with Ceres, diff of dec. 3. 56. S.
	18	16	☿ in conj.with Pallas, diff of dec. 26. 57. S.
10			Clock after the sun, 15m. 56s.
	—		☽ rises 11h. 50m. M.
	—		☽ passes mer. 3h. 4m. A.
	—		☽ sets 6h. 19m. A.
	16	24	♀ at greatest brilliancy
13	0	0	Pallas in conj.with Ceres, diff. of dec. 23. 9. N.
	22	27	♀ in the ascending node
	—		Mercury R. A. 16h. 16m. dec. 23. 25. N.
	—		Venus R. A. 12h. 34m. dec. 3. 53. S.
	—		Mars R. A. 18h. 3m. dec. 24. 40. S.
	—		Vesta R. A. 13h. 1m. dec. 1. 0. S.
	—		Juno R. A. 1h. 10m. dec. 8. 31. S.
	—		Pallas R. A. 16h. 1m. dec. 4 30. N.
	—		Ceres R. A. 16h. 1m. dec. 18. 39. S.
	—		Jupiter R. A. 14h. 7m. dec. 11. 47. S.
	—		Saturn R. A. 16h. 35m. dec. 20. 33. S.
	—		Georg. R. A. 22h. 56m. dec. 7. 35. S.
	—		Mercury passes mer. 0h. 49m.
	—		Venus passes mer. 21h. 5m.
	—		Mars passes mer. 2h. 51m.
	—		Jupiter passes mer. 22h. 36m.
	—		Saturn passes mer. 1h. 7m.
	—		Georg. passes mer. 7h. 28m.
14	9	13	☽ in □ or first quarter.
	—		Occul ι Aquarii im. 6h. 54m. em. 8h. 1m.
15			Clock after the sun, 15m. 16s.
	—		☽ rises 1h. 51m. A.
	—		☽ passes mer. 7h. 11m. A.
	—		☽ sets morn.
	11	47	Her: in conj. with the ☽ diff. of dec. 0. 49. S.
	—		Occul 81 Aquarii im. 10h. 19m. em. 11h. 17m.
	—		Occul 82 Aquarii im. 11h. 22m. em. 12h. 13m.
	—		Occul *Georgian* im. 12h. 42m.
16	4	55	☿ in conj. with ♄ diff. of dec. 3. 45. S.
17			Occul 62 Piscium im. 13h. 31m. em. 14. 26.
20			Clock after the sun, 14m. 16s.
	—		☽ rises 3h. 11m. A.
	—		☽ passes mer. 11h. 34m. A.
	—		☽ sets 6h. 43m. M.
	—		Juno stationary
	7		☽ in Perigee.
	—		Occul *g* in Pleiadium im 12h. 51m. em. 13h. 56m.
	—		Occul *b* in Pleiadium im 13h. 4m. em. 13h. 36m.
	—		Occul *e* in Pleiadium im 13h. 7m. em 14h. 13m.
	—		Occul *c* in Pleiadium im 13h. 20m. em 14h. 26m.
21	2	13	Ecliptic oppo. or ○ full moon
22	6	57	Her: stationary.
	—		Occul 136 in Tauri im 9h. 24m. em 10h. 13m.
23	2	1	☿ greatest Hel. Lat. S
24	18	22	Pallas in conj. with the ⊙
25			Clock after the sun, 12m. 55s.
	—		☽ rises 8h. 36m. A.
	—		☽ passes mer. 3h. 51m. M.
	—		☽ sets 0h. 13m. A.
27	10	26	☽ in □ or last quarter
30	7	15	☿ greatest elong. 21. 16. E.

The Satellites of Jupiter are not visible this month, Jupiter being too near to the Sun.

J. LEWTHWAITE, Rotherhithe.

THE

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CONJOINED SERIES.

No. XCIV.

Recent Patents.

To Joseph Whitworth, *of Manchester, in the county palatine of Lancaster, engineer, for his invention of certain improvements in machinery for spinning and doubling cotton, wool, and other fibrous substances.*—[Sealed 19th November, 1836.]

My invention of certain improvements in machinery for spinning cotton, wool, and other fibrous substances, consists in certain additions to, and variations from the plan or mechanism of a self-acting mule, for which his late Majesty King William the Fourth, was graciously pleased to grant me his royal letters patent, dated at Westminster, fourteenth day of April, one thousand eight hundred and thirty-five; the specification of which invention was duly enrolled in Chancery, in the Office of the Rolls Chapel, on or before the fourteenth day of October, in the same year; to which specification it may be necessary to refer, for the better understanding of the adaptation and arrangement of my present improvements.—(See vol. 8, p. 1, present Series.)

The particular features of novelty which constitute the subject of my present invention, may be described under two heads; first, an improved arrangement of mechanism, constituting the headstock of a self-acting mule; and, second, an improved adaptation of expanding pullies for winding the yarns on to the spindles.

In the accompanying drawings, plate IX., fig. 1, represents a plan or horizontal view of the general features of a self-acting mule, with my present improvements applied thereto. Fig. 2, is an elevation of the back of the same, the novel mechanism being shaded, and the other parts delineated in outline. Fig. 3, is a sectional elevation taken transversely through the mule carriage, near the headstock; and fig. 4, is a similar sectional elevation, taken through the mule carriage, near the right-hand end of fig. 1.

For the better explanation of the construction and arrangement of the improved headstock, I have represented it upon an enlarged scale, and partly in section, at figs. 5 and 6, which will tend to elucidate the movements of the parts about to be described, in reference to the foregoing figures, in all of which the same letters indicate the same parts of the mechanism..

A vertical shaft *a*, receiving its rotary motion from any first mover, communicates that motion by means of the drum-pulley and strap *b, b,* to two pullies *c*, and *k*; the former of which pullies is fixed upon an upright shaft *d*, mounted in the headstock. The rotation of this shaft *d*, driven by the strap *b*, and pulley *c*, gives motion through bevel gear *e, e, e,* to the drawing rollers, as represented in figs. 1, 2, and 3. To the lower end of this shaft *d*, a bevel pinion *f*, is affixed, which takes into a bevel wheel *g*, turning loosely upon the long horizontal shaft *h*, *h*, *h*, extending at the back of the mule. When this loose wheel *g*, is locked to the horizontal shaft *h*, by means of the clutch *i*, the pinion *f*, causes the shaft *h*, to revolve, and by means of the bevel gear, at the end of the shaft, to drive, with an uniform velocity, the worm shafts E*, E*, (as in the specification of my former patent,) for the purpose of conducting the carriage out, and giving the stretch to the yarns. Whilst the carriage is thus running out, and the yarns are stretching, the operation of twisting is also to be performed, which is effected by the following means:—

The pulley *k*, which is exactly similar to the pulley *c*, is fixed upon the upper end of a tube *j*, *j*, which tube embraces the lower part of the upright shaft *d*, turning loosely upon it; and to the lower end of this tube *j*, a grooved pulley *l*, is affixed, which carries the endless band *m*, that drives the grooved pulley *n*, mounted in the mule carriage, as seen in figs. 1 and 3, and which gives rotary motion to the drums that actuate the spindles. The mule carriage, having proceeded nearly to its extent, comes against a stop, fixed upon a horizontal rod *o*, extending in a transverse position from the lever *p*, of the clutch *i*, and by the carriage thus striking against the stop, the rod is made to draw the clutch lever *p*, and to throw the clutch *i*, back, and disconnect the shaft *h*, from the driving gear, which instantly stops the progress of the mule carriage. At the same time an arm *q*, having a slot near the end of the clutch lever *p*, acts against a vertical lever *r*, and by drawing the lower end of that lever forward, releases the catch at its upper end from the notch 1, of the vertical bolt *s*, *s*, which carries the strap guider. The bolt *s*, slides in socketed brackets, extending from a vertical standard, and being loaded by a weight *t*, descends by its gravity as soon as released from the catch, and in so doing passes the driving strap *b*, from the two pullies *c*, and *r*, on to the next pulley *u*, the bolt having fallen from the notch 1 to the notch 2, which notch now rests upon the end of the lever *r*. The last-mentioned pulley *u*, turns loosely upon the tube *j*, and therefore at this time, the shaft *d*, remains stationary, which is the period for what is technically called "backing off," that is, unwinding a portion of the yarn off the spindles to the nose of the cop. At the lower end of the vertical bolt *s*, there is a small tumbler or trigger hanging upon a pivot, the end or operating part of which tumbler is formed as an inclined plane; and, as the bolt *s*, descends, this inclined plane presses against a projecting finger, near the end of a horizontal sliding spring bolt *v*, and pushes the bolt back. The reverse end of this horizontal bolt *v*, is inserted into a notch in the side of a vertical bolt *w*, sliding in socketed brackets, extending from a standard in the frame of the headstock, which vertical bolt carries the strap guider of the backing-off apparatus; and when the horizontal bolt *v*, is drawn away from the notch by the action of the tumbler, as described, the vertical bolt *w*, is brought down by the force of its spring, and the driving strap is shifted from the pulley *x*, to the pulley *y*.

The strap of the backing-off apparatus is driven by a pulley *z*, which is fixed upon a shaft, in connection, by gearing with the first driving shaft *a*. The pulley *x*, slides loosely upon the tube *j*, in the headstock, but the pulley *y*, is fast to the tube *j*, and consequently, when the driving strap passes from the loose pulley *x*, to the fast pulley *y*, the tube *j*, is made to revolve in an opposite direction to its former rotation, and thereby to give such movement to the band pulley *l*, as will cause the spindles to turn the reverse way, and thereby back off the yarns. The carriage is now to be run in, which is done by the following means:—

The action of the faller, in descending, causes a lever to operate upon, and to bring forward the horizontal rod A, which, being connected to the lower end of the lever *r*, draws that end of the lever with it, and thereby releases the bolt *s*, which rested upon the top of that lever. This mode of taking forward the rod A, I do not however claim as new, and therefore, do not think it necessary more particularly to describe it. The bolt *s*, being thus released, descends from the notch 2, to the notch 3, and, in so doing, lets the driving strap pass down on to the pulley B, which turns loosely upon the tube *j*, and is hence made to revolve by the friction of the driving strap. The same advancing movement of the rod A, also causes a tooth or inclined plane, on its side, to press against a pendant catch lever *c*, and by pushing that lever back, to allow the weighted end of the lever D, to fall off the catch, when the reverse end of that lever, rising, lifts the bolt *w*, and passes the backing-off strap up on to the loose pulley *x*.

A pinion E, is made fast to the boss of the loose pulley B, and consequently is driven round with it; and this pinion E, taking into an intermediate wheel F, which is in gear with the teeth of the scroll wheel G, causes the scroll wheel now to receive a rotary movement. The periphery of the scroll wheel being of variable radii, and winding round at different altitudes, it is necessary that the intermediate wheel F, should advance and recede, in accordance with the varying radii of the scroll wheel, for the purpose of always keeping in gear with it; and that the scroll wheel should ascend and descend, in order that the operating part of its periphery should always be in coincidence with the intermediate wheel. The intermediate wheel is brought into gear with the scroll wheel, by its axle being mounted in a swinging carriage H, which, turning loosely upon the tube *j*, is kept in gear by a weighted cord attached to its arm I, as shewn in figs. 1, 2, and 3.

To the scroll wheel G, a screw K, is attached, which works in a socket L, affixed to the frame; and through the scroll wheel and screw, the vertical shaft M, passes, and is locked thereto by a key and groove, which allows the scroll wheel to slide up and down.

It will now be perceived, that as the loose pulley B, is made to revolve by the driving strap, the pinion E, affixed to it, will revolve also, and give rotary motion to the intermediate wheel F, and that the teeth of this last taking into the scroll wheel G, will cause that wheel, and its shaft M, to revolve. As the scroll wheel G, goes round, its screw K, working in the concave worm socket L, causes it gradually to descend upon its shaft, and thereby to bring the different radii of the scroll into operation with the intermediate wheel,—and though the driving pinion E, and wheel F, give a uniform rotary movement, yet the periphery of the scroll wheel being of several radii, the speed of different parts of its rotation, and that of its shaft M, must vary according to the radius of that part of the scroll with which the intermediate wheel F, is in operation. At the lower part of the vertical shaft M, a bevel wheel N, is affixed, taking into a bevel pinion O, on the horizontal shaft *h*, extending along the back of the mule; hence the same variable speeds, with which the shaft M, revolves, will be communicated to the shaft *h*, and to the transverse screw shafts, and consequently, the carriage, in running in, will have a correspondent variation of speeds.

It being now understood in what manner the carriage is brought in, by means of the worm shafts E*, E*, as described in my former specification above referred to, I proceed to explain the contrivance for winding the yarns on to the spindles, by means of drum-bands, actuated by variable or expanding pullies.

In the horizontal or plan view of the mule, seen at fig. 1, and also in the transverse section, fig. 4, a straight rack-bar P, is shewn, securely fixed upon standards, resting on the floor of the mule room; into this rack a pinion Q, takes, which pinion is fixed on the vertical shaft of the band pulley R, mounted in the mule carriage, and consequently, as the carriage runs in, the band pulley is made to revolve. From this pulley R, an endless band extends round a corresponding pulley S, on a vertical shaft, mounted near the middle of the mule carriage, and causes the shafts of R, and S, to turn simultaneously. Upon the latter shaft a toothed wheel T, is fixed, taking into another toothed wheel U, upon the shaft of the drum-band pulley V; from which pulley V, the endless bands extend, which drives the drums that actuate all the spindles.

It will be perceived, that by thus deriving the taking-up motions of the spindles from the running in of the carriage, through the agency of the rack P, and pinion Q, that the velocities of the spindles would always bear the same relation to the travelling speed of the returning carriage; such, however, must not be the case; for, as the conical figures of the cop bottoms are forming, and the cops are building up, different speeds of the spindles will be required in order to wind the yarns, with equal tension, upon the diameters of the conical figure of the cop bottom. This necessary variation of speed, I effect, by causing the band pullies R, and S, to increase and decrease in their diameters during the running in of the carriage; and also by regulating their expansion and contraction in accordance with the formation of the cop bottom.

Fig. 7, represents, in elevation, the expanding pulley R, and its shaft, detached and drawn upon an enlarged scale. Fig. 8, is a horizontal view of the same, as seen looking down upon the upper surface of the pulley. The periphery of the pulley is formed by several moveable segments a, a, a, sliding upon the arms b, b, b, of a wheel W, fixed upon the perpendicular shaft. Below this wheel W, there is a disc X, in which several convolute slots are cut, corresponding, in number, with the moveable segments a, a, a. Through each of these slots a stud c, extending from the under sides of the respective segment pieces a, is passed, for the purpose of guiding them and keeping them firm in their positions. The disc X, is fixed upon the top of a lantern box Y, and with it turns loosely on the shaft d. The lower part of this shaft d, is made hollow, and a spindle e, rising from a truck f, passes some distance up it. Through the spindle, and through slits cut in the sides of the hollow part of the shaft d, a transverse bolt g, passes, the ends of which work in two opposite spiral grooves i, i, formed in the sides of the lantern box Y. The truck f, has small antifriction rollers, running upon a railway Z, mounted on the floor, transversely, under the mule carriage, (as seen in figs. 1 and 4,) which is to be raised at the front end from its horizontal position, gradually, whilst the cop bottom is forming.

The lifting of the front end of the railway may be progressively effected by means of a click striking every time the carriage runs out against a ratchet wheel, on the screw standard h, or by any other convenient means, which I do not intend to claim.

When the railway Z, has been thus made to form an inclined plane, the running out of the mule carriage will cause the truck f, by ascending the railway, to raise the spindle e, in the socket of the shaft d, and consequently to pass the transverse bolt g, higher up the spiral grooves i, i, of the lantern box Y, which will shift the lantern box, and the disc X, a little distance round, and thereby cause the sides of the convolute slots in the disc to press the studs c, inward, and consequently, to contract the diameter of the pulley R. A corresponding railway, placed at K, near the middle of the mule, parallel to Z, is mounted upon the floor, and worked in a similar way, upon which a truck, as f, runs, having a spindle passing up into a hollow within the shaft of the wheel of the pulley S;—this pulley, like R, is formed by several segments a, a, a, sliding upon a wheel fixed upon an upright shaft, and these segments have each a stud c, at their under side, projecting through convolute slots in a disc below. The convolute slots in the disc under the pulley S, curve in a contrary direction to those of the disc under the pulley R; but the spiral grooves i, i, formed in the sides of the lantern box upon which this disc is fixed, curve in the same direction as those of the lantern box Y; consequently it will be perceived, that by the running out of the carriage, the trucks passing up the inclined railways Z, and K, will cause the pulley S, to expand, whilst the pulley R, contracts; and when the carriage runs in, and the trucks pass down the inclined railways, this effect will be reversed, the pulley S, contracting, and the pulley R, expanding.

The object of thus expanding and contracting the pullies R, and S, is, that during the running in of the carriage, variable speeds may be given to the shaft of the pulley S, in order that the pinion upon it may so act upon the shaft of the drum-band pulley, as to cause the series of spindles to turn, with varying but certain speeds, whilst winding on the yarns, in forming the cop bottoms, and in building up the cops; the utility of which, in mule spinning, is well understood by practical spinners.

The carriage, in running in, strikes against the end of a horizontal spring bolt l, l, in the headstock, and pushes it back; and this bolt, having a long slot cut through it, towards its hinder part, when so pushed back, allows the vertical bolt m, to descend, by passing through its slot, and by means of the weight and cord n, n, to lift the bolt *s*, of the strap guider, and shift the driving strap from the pulley B, to the pullies *c*, and *k*, when the evolutions of the mule again commence, and go on as before described.

As the carriage comes in, an inclined arm, affixed to the back of it, comes in contact with a bent arm, extending from the weight of the lever D, and raises that lever up on to its catch C, as represented in fig. 6.

In order to raise the fallen bolt m, and the weight n, a loose pulley o, is placed upon the back horizontal shaft h, which loose pulley carries a click p, taking into a ratchet wheel q, fixed upon the said shaft *h*, and a cord from the pulley o, passes to the top of the shaft of the bolt m. In the running in of the carriage, the shaft h, revolves in a retrograde direction, and in so doing, by friction alone, causes the loose pulley o, to turn and bring the click p, up to the top of the ratchet wheel, when the click falls into the teeth of the ratchet by its own gravity.

On the carriage running out, the shaft h, turns the reverse way, and causes the ratchet wheel to drive the click p, and loose pulley o, round to the stop i, which pulley, by winding up the cord s, attached to it and to the bolt m, raises the fallen bolt m, with its weight n, when the horizontal spring bolt l, returns to its place and supports the falling bolt m, as shewn in fig. 6.

In conclusion, I desire it to be understood, that I claim under the above recited letters patent, the improved construction and arrangement of the mechanism, constituting the headstock of a self-acting mule; and the adaptation and arrangement of the expanding pullies for actuating the spindles with the parts connected thereto, for working the said pullies as exhibited in the several figures of the accompanying drawings, above referred to. — [*Inrolled in the Rolls Chapel Office, May* 1837.]

Specification drawn by Messrs. Newton and Berry.

To HENRY ROBERT ABRAHAM, *of Keppel-street, in the parish of St. George, Bloomsbury, and county of Middlesex, civil engineer and architect, for his invention of new or improved apparatus for regulating the supply of water or other liquids, and the quantity delivered into receivers.*—[Sealed 14th June, 1838.]

THIS invention of new or improved apparatus for regulating the supply of water or other liquids, and the quantity delivered into receivers, consists, firstly, in certain new constructions and arrangements of the parts and details of cocks and valves, used in the delivery of fluids, by which their action is improved, and their capabilities for resisting pressure increased, and by which, also, they may be made more durable and less subject to leakages; secondly, in the application of a known principle, called the hydrostatic paradox, to the delivery and regulation of liquids, by which that principle is made an effective agent, either self-acting or assisted by machinery; thirdly, in the combination of the above principles, with other means to feed boilers or other vessels, either against pressure or otherwise, by which co-efficiency the pump or supplying force may be assisted or relieved from pressure, either gaseous or liquid, at the moment of supply; and by the contrivance of a self-acting valve or apparatus, fixed in the boiler or receiver, or communicating therewith, a reduction of pressure and friction upon the supplying force is obtained, and the receiver filled more promptly; the casualties arising from want of water or other liquid in close boilers, being, by these means, prevented.

I do not intend to limit the construction of my improvements to the particular forms and arrangements delineated in the accompanying drawings; but I claim the application of the inventions generally, in the most comprehensive sense,—that is, however, modified as to forms or arrangements.

The several letters of reference in the figures, point out similar parts in each view of the same object. Plate XI., figs. 1, represent in several views, a guage tap. A, being an elevation; B, a section, taking vertically; C, a horizontal view; and D, a front view of the guage tap. *a*, is the valve, formed as the frustrum of a cone, attached to a horizontal spindle *b*, working in guides or bridges *c*, *d*. A key *e*, works in front of the valve seat; and *f*, is a pin, which may be screwed up to give to the key and handle *g*, any amount of friction. *h*, is a stop for the handle *i*, *i*, flanges, and screw, by which the two parts of the barrel are connected. The flanges are worked acutely within, in order to prevent the washer being blown out under pressure. In this form of cock or tap, the action of the handle prevents the hand from being scalded while using it.

Figs. 2, represent in several views, a cock, either as a union cock or a bib cock, if made with a round nose. A, is an elevation of this cock; B, a section, taken vertically; C, a plan or horizontal view; E, and F, end views; *a*, *a*, the conical valve fixed on a horizontal spindle; *b*, *b*, bridges; *c*, a key, either forked or otherwise, working the spindle and valve *a*. The key may have a perforation for the spindle *d*, which is fitted thereto, and into the plughole in the box *e*; *f*, is a socket, ground to fit accurately at *g*, in the box. A washer *h*, with ears, slips into notches in the female screw *i*. A screwed cap *k*, secures the action and regulates the friction of the cock; *l*, is the lever. In these figures, the box *e*, is a receiver for liquids flowing commixed with gases, from which they may be easily emptied.

Figs. 3, represent a variation of the above construction, with the action reversed for ordinary use. Figs. 4, exhibit a ball valve-cock, similar in principle, so far as relates to the action of the spindle, to the foregoing, but having the front guide open for the protrusion of the spindle, which, when unobstructed, is impelled forward, and the valve driven upon its seat by the action of the liquid pressing upon it,—but retained open by the intervention of the excentric *k*, worked on the rod of a float *l*, *l*, and turning on the centre *m*, until the float has risen above the cock, when it is slowly relieved, and the valve finds its seat. The novelty of this cock consists in the proper arrangement of the valve seat, at an angle which prevents the recursion of the valve, and the reciprocating movement, which is otherwise communicated to it under great pressure. The screwed valve box, which gives easy access to the valve and the excentric, upon the ends of the float rod, not intercepting the water-way, are new forms. A, is an external view of the cock and ball; B, is a section of the same, taken vertically; C, a top view; D, a front view; *a*, the valve; *b*, the spindle; *c*, and *d*, guides or bridges.

Figs. 5, represent, in several positions, a conical plugcock, principally applicable where liquids flow slowly into receivers, and for hot liquors. This cock may be worked by the direct impulse of a float, or with a guide and lever passing through a slot in the spindle of the plug. A, is an external view of the cock; B, a section of the same, taken vertically; C, top view; D, front view of the cock; *a*, the plug; *b*, the spindle; *c*, the guide; *d*, the slot in the spindle; *e*, the lever; *f*, the float; E, represents the same construction of cock, worked by the direct impulse of the float *f*; F, is a section of the same; G, is a front view; and H, a top view of the cock without the float.

Figs. 6, represent a conical plug-cock for liquids, and particularly those in commixture with gaseous fluids, where the liquid portion is required to be separated; in which case, the box below the plug receives the liquor, giving the gas free passage, the liquor being emptied in any ordinary way. A, is an external elevation; B, a section of the same; C, top view; D, horizontal section, shewing the bottom; *a*, a threaded spindle working through and in the conical valve, by rotation, elevating or depressing it; *b*, the valve, having guides *c*, *c*, which work in perpendicular grooves in the box *d*, *d*. The screw of the spindle is worked by the usual means of lever or key fixed on the square *f*, and the lower end of the spindle turns in the step *e*, at bottom; *g*, is the pipe for the discharge of the liquor, or it may be drawn off through a hollow spindle.

Figs. 7, represent a meter to determine the quantity of liquid passed through an aperture. A, is an elevation of the meter; B, a section of the same, taken vertically; *a*, is the chamber or barrel, in two parts, united at *b*; spiral fans *e*, are attached to a spindle, so disposed as to give motion to the endless screw *d*, which communicates with the clock work *e*; and by the rotation of a dial plate *f*, or by other indicators, shewing the number of revolutions of the spiral, and necessarily the quantity of liquid discharged through the orifice of the attached pipe.

Figs. 8, exhibit the hydrostatic valve. This apparatus is put in action by the pressure of a fluid column, or the dilatable or lifting part or parts of a receiver, on the principle of the hydrostatic paradox.

The pressure of the superincumbent or opposing force being relieved by a surrounding case or other means, and the power obtained by the pressure of the fluid column, so communicated to the extensible receiver, is transferred to affixtures thereon, so as to shut or open valves under great pressure, and effect other mechanical purposes for the regulation of liquid supply.

The apparatus is relieved from action by emptying the supply pipe; this part of the machine being so constructed as to regulate the action of the whole, and to discharge, as may be required, its altitude of fluid or liquid, either to waste or re-use, as may be necessary. And this apparatus may also be worked by the action of an external super-ponderating force, displacing the column of liquid, which maintained the dilatable part of the receiver in extension, and be made to discharge the pressing column into a receiver above it, from which it would again descend, when the external pressure was removed, and both these cases may be exemplified in manner following:—

First, by the descent of the fluid into the receiver. A, is an elevation of the apparatus for closing a valve against pressure; B, the section, taken vertically; *a,* is a receiver, which may be formed, as in the drawing, by a waterproof flexible band, secured round a metallic or other disc *b,* and also to a plate *d,* below it; or it may be formed as a cylinder and piston, after the manner of those used for steam-engines, but in both cases being made to communicate with a tube or tubes *e* and *f,* and secured from external pressure of liquid by a case *g, g,* having a perforation for a shaft or spindle *h,* affixed to the rising plate, and a stuffing and guide or washer, or some other contrivance, to secure a vertical action and prevent leakage from above. To this spindle may be connected the water-way and valve *i*, and the outer case be screwed to the bottom plate; a small pipe *k*, may communicate with a waste pipe *l*, to prevent the case from accidentally filling.

If the apparatus described be placed at the bottom of a cistern, (both the receiver and tube being empty, and the upper disc or piston down upon the bottom plate, and the top of the tube about the level of the top of the cistern, and the waste pipe *l*, passing through the bottom as usual for waste pipes), then if a service pipe be attached to the valve seat *i*, and liquid admitted, when the cistern becomes nearly full, a quantity would flow down the pipe *e*, into the receiver, and throw up the valve *i*, with a force proportionate to the height of the column of liquid in the tube multiplied by the area of the disc; and by this means, great power may be gained. A leakage in the pipe *f*, into the waste pipe, regulates the continuance of the power, and limits its duration.

In the other case, the power may be applied as at H, figs. 9, about to be described, where *p*, is a receiver filled with liquid, similar to that already shewn, but without the case *g*. The tube *q*, is filled with liquid to a height that will extend the receiver with a given force; a shallow vessel *i*, above the tube, is open to the atmospheric pressure, and receives the rising liquid,—a lantern frame *s*, *s*, sustaining the bottom plate. Any adventitious force acting upon *p*, will depress the top plate, when it exceeds the power of the sustaining column *q*, and will force the liquid into the receiver *r*, at the same time opening the valve *t*, affixed to the top plate of the receiver; and upon the weight being removed from *p*, the fluid will regain its place in the receiver and reclose the valve.

Fig. 9, represent an apparatus by which the water in steam-boilers may be saved for re-use after condensation;

and by which pressure opposing the supplying force, may be relieved in the moment when free action is necessary. I do not claim the invention of this principle of supply by equalization of pressure, but only certain improvements on the principle which will work it more effectually and more safely.—A, represents an external elevation of this apparatus, and B, a section of the same, taken vertically; *a*, is a close vessel communicating with a boiler *b*, by tubes *c*, *c*, and *d*; *e*, *f*, *t*, are valves shutting off communication; *g*, a float; *h*, a guide; *i*, a lever to work the valve; *f*, *k*, a supply pipe with a valve *l*, opening upwards; *m*, a hollow float. If the float *g*, is so contrived, that when the steam in the boiler *b*, is at a given pressure, and the water at a given height, the valve *e*, shall be closed,—and if the regulator H, be so contrived, that at the same pressure it shall maintain the valve *t*, in its close position,—and if the valve *f*, be closed by the lever *i*,—then if the vessel *a*, be full of water, none will flow into the boiler; but if the water becomes low, and the float *g*, descends, the valve *e*, is first opened, and the steam will rise from the boiler into the vessel *a*, above the float *m*, for which may be substituted a diaphragm or a bag of air or gas. When an equilibrium between *a*, and *b*, is formed by the ascent of the steam, water will flow into the boiler through *d*; and when a vacuum is produced by condensation, a supply may readily be given to *a*, by the pipe *k*.

The float *g*, should be so poised, that the pressure of steam upon the valve *e*, shall assist its flotation, until the water nearly leaves the float; it will then drop and not again rise, until nearly covered with water; an interval for the action of the steam will thus be given. The valve *f*, is not opened until an interval after *e*, has been opened. This arrangement is necessary for the increments of action and for the prevention of sudden pulsion of the valves. The float *m*, or other suitable contrivance, will prevent the sudden contact of steam with the colder fluid, and too rapid condensation, and will otherwise assist the delivery of the liquid.

The contrivance H, upon any sudden increase of pressure, assists the other valves and also the supply of water, at a high temperature, to the receiver; and will, upon any occasion of danger, relieve the pressure from the supplying force.—[*Inrolled in the Rolls Chapel Office, December* 1838.]

Specification drawn by Messrs. Newton and Berry.

To JOHN FREDERICK BOURNE, *of Manchester, in the county of Lancaster, engineer, and* JOHN BARTLEY, Junior, *of the same place, engineer, for their invention of certain improvements in the construction of wheels to be used upon railways or other roads, and which improvements are also applicable to the construction of wheels in general.*—[Sealed 6th September, 1838.]

THESE improvements in the construction of wheels to be used upon railways and other roads, and which improvements are also applicable to wheels in general,—consist, firstly, in the peculiar method of preparing and putting together the ordinary parts of such wheels, as the felloe, spokes, and nave; and, secondly, in the application of certain machinery or apparatus for the purpose of bending the tyre, hoop, or rim, of locomotive engine or other wheels to be employed upon railways, or of any other wheels where loose or separate tyres are used.

In order that these improvements may be more particularly explained, we have attached to these presents two sheets of drawings, and marked the same with figures and letters of reference, in correspondence with the following details. We will firstly describe our improvements as suitable to that description of wheels, which are to be employed upon railways, and to be composed entirely of wrought iron, and illustrated in Plate X.

We form the nave of the wheel, by taking two straight pieces of bar iron, of about three inches square, and when heated, bend each of them into a ring of the size of the intended nave, as in fig. 1, at *a*, or the nave may be formed by taking a solid mould from the forge, and cutting or forging it to the required form. We then take twenty-four pieces (more or less, according to the number of arms of the intended wheel) of flat bar iron, about three inches by one and a quarter inches, each of them half the length of the intended arm or spoke, with sufficient allowance for welding; and having formed a head to each of them, as in *b*, fig. 1, we "jump" or weld, six (more or less) of them on to each ring or semi-nave in such a manner that the longest section of the arm (namely, three inches), shall stand in the direction of the running course of the wheel, having the edge of the arm towards the front of the engine, and the flat surface to the side, as in fig. 2, *a*, *a*, *a*. The remaining twelve pieces (more or less) or semi-arms, are next to be welded on to twelve pieces (more or less) of flat bar iron, say five and a quarter inches by one inch and a quarter, and of the length of one-twelfth part of the circumference of the periphery or rim of the wheel, as at *c*, *c*, in fig. 1; and during this process of welding, the arm is placed into, and the segment of the felloe on to a block, and hammered thereupon, which will give the segment the proper curve to form the periphery of the wheel, as commonly practised; six or one-half of the number of the semi-arms thus formed upon the felloes, and the semi-arms also formed upon each ring or semi-nave, are then to be welded together at the joints *b*, *b*, *b*, in fig. 2, and will thus present the forms as represented in figs. 3 and 4; all the arms or spokes in fig. 3, being set or "dished" one way, and all the arms in fig. 4, being set or dished the reverse way, as shewn in the detached sectional fig. 5. The portion of the wheel, fig. 3, is then taken and laid upon the portion of the wheel, fig. 4, in such a manner, that all the segments *c*, *c*, *c*, shall form an entire rim or felloe, and all the arms or spokes *d*, *d*, *d*, in fig. 3, exactly intersect the spaces between the arms *d*, *d*, *d*, in fig. 4; thus presenting an entire wheel as shewn in the front view, fig. 6, and in section in fig. 7. Small angular pieces are then to be cut out of the points of contact of the segments forming the felloe, and corresponding v pieces are to be welded in their place, as at *e*, *e*, *e*, in fig. 8, in the usual manner, in order to ensure a good welding, and thus form a solid felloe. The wheel will now be found entire, and of solid wrought iron, as well as possessing considerable strength and durability, having the peculiar advantage of having each alternate arm dished in opposite directions, in order to resist any lateral pressure; and also, having all the arms placed edgewise to the line of motion,—so that, when the wheel is revolving, the smallest portion or narrowest edge shall be presented to the resistance of the atmosphere. Moreover, if power be applied from the axle to the periphery of the wheel, it will proceed through the arms or bars of iron placed in the best position to communicate that power without yielding,—namely, with their longest section opposed to it. The wheel in the state just described, is now fit for the lathe, in order to have the felloe turned to the proper cone and flanch, or to receive an ordinary outside hoop or tyre, which is to be shrunk or contracted, and rivetted on in the usual manner. The complete or finished wheel is shewn in front view, at fig. 9, and an edge view at fig. 10; although we consider the above described wheel, as the best calculated for locomotive engine wheels, particularly the "*driving wheels*," yet, we would not confine ourselves to flat arms for such purposes, as they may be of round bar iron, as in fig. 11, or of any other suitable form; but put together in the manner above described.

Another description of wrought iron wheel, of a cheaper construction and more suitable for waggons or carriages, we construct, by first preparing a straight bar (either flat, upon its surface, or made with a flanch, as upon railway tyres), of the full length of the periphery or felloe of the intended wheel, and "jumping up," or welding one-half of every spoke or arm at equal distances, apart from the straight bar or tyre, as shewn in fig. 11*; the bar is bent either in the ordinary way, or by a process hereafter to be described, in order to form the felloe of the wheel, and assumes the form of fig. 12; every alternate semi-spoke, is then set or "dished" one way, and every other one is "dished" in the reverse direction. The cross fig. 13, consisting of one ring, forming the semi-nave, and a portion, or half the number of spokes welded thereto, is then placed in the position represented by dotted lines in fig. 12, and welded to the other half of the corresponding semi-spokes, at *a, a, a, a*, so that the eye *c*, in fig. 13, shall be exactly in the centre of the wheel; another semi-nave, exactly similar to fig. 13, is then to be placed above this, and its semi-spokes placed to correspond with the remaining semi-spokes on the felloe, and these must also be welded together at *b, b, b, b*; the opening in the felloe or tyre is then shut and welded, and the wheel complete, as represented in fig. 14. A good waggon or carriage wheel may also be made upon the same plan as the one last described, by having the arms welded upon the tyre bar in their whole length, and bending the tyre bar to form the felloe, thus bringing all their ends towards the centre, where they may have a nave cast around them.

Another improved construction of wrought iron wheel, with a cast iron nave, is represented in fig. 15. This wheel is constructed by taking a straight bar, (or segments, if preferred), with or without a flanch, according to the wheel required, and of the same length as the periphery or circumference of the wheel; holes are then to be punched at equal distances apart, and of corresponding number, with the number of spokes required, and the holes countersunk, so that they taper towards the centre of the wheel;—arms rounded at the ends to fit the holes in the tyre, and having a collar or shoulder at the distance of half an inch or more from the same end, and flattened and punched at the other end, are to be prepared, and the rounded end heated, which is then to be put into the hole made in the tyre and rivetted therein, as shewn in fig. 16; and each alternate arm, set or "dished" in opposite directions, as shewn in the sectional fig. 17; a cast iron nave is then to be cast in the centre, embracing and fastening all the other ends of the arms, when it may either be finished with a plain rim, or be provided with an outer tyre. Figs. 18 and 19, represent two descriptions of spokes adapted to this wheel; fig. 18, being round arms, and fig. 19, flat or square.

It will also be evident that, wheels of a simpler construction, and to be employed for lighter purposes, may be made upon the foregoing principles; but with only one set of arms, instead of a double set, and all "dished" or set in the same direction; or, if it should be preferred, the spokes may be set perpendicularly.

The second feature of our improvements is shewn in sheet 2, of the drawings, and consists in the application of certain mechanism or apparatus, for the purpose of bending the tyre, iron, or bars, by mechanical power, instead of the usual method of bending them by manual labour. Fig. 20, represents a side elevation of a machine to be used for this purpose; and fig. 21, a plan or horizontal view of the same, as seen from above. The framing of the machine is shewn at *a, a, a, a,* carrying the shafts *b, b,* and *c;* the shafts *b, b,* are mounted in pedestals in the frame, and the shaft *c,* is supported by adjustable bearings, sliding in mortices in the frame *a, a.* Upon the upper ends of the shafts *b, b,* are two rollers *d, d,* having grooves turned in their peripheries, corresponding with the flanch upon the tyre bar; and upon the upper end of the shaft *c,* is mounted a plain roller *e,* to form the flat under surface of the hoop or tyre. In rolling the hoop or tyre, we first cut the bar to the required length, and heat it in a stove or furnace to a red heat, and after having bent it slightly edgewise on a block, sufficiently to allow for the difference in thickness between the flanched edge and the other, we pass it between the rollers *d, d,* and *e,* as shewn in the drawings. The rollers are then turned by means of a driving strap passed around the fast pulley *f,* upon the main shaft *g,* which actuates the bevilled wheels *h, h,* and spur wheels *i, i,* keyed upon the shafts *b, b,* carrying the rollers. The diameter of the circle or the size to which the tyre iron is to be rolled or bent, is determined by the regulating screws *k, k,* which cause the roller *e,* to approach or recede from the rollers *d, d,* and consequently to vary the curve thus given to the tyre bar. *l, l, l, l,* is a light platform of rollers, for the purpose of supporting the tyre iron while it is in its heated state and under the process of bending.

The detached fig. 22, represents the necessary alteration required to be made in the roller *e,* when the machine is to be used for bending a tyre iron which has arms or semi-arms welded to it, as in fig. 22, when it will be evident that the roller *e*, must have a groove or recess *m*, formed in it to allow the arms or semi-arms to pass.

Having now described each particular of our invention, and the manner in which the same is to be performed, we desire it to be understood, that we claim as our invention, firstly, the manner in which such wheels are constructed or put together, as are represented in the various figures of the drawings, and above described; and secondly, in the application of such or similar apparatus, as represented in figs. 20 and 21, of the drawings, for the purpose of bending tyre bars or hoops, to be attached to locomotive engine wheels and all other wheels, where loose or separate tyres are applied.—[*Inrolled in the Rolls Chapel Office, March* 1839.]

Specification drawn by Messrs. Newton and Berry.

To Benjamin Goodfellow, *of Hyde, in the county of Chester, mechanic, for his invention of certain improvements in metallic pistons.*—[Sealed 18th December, 1838.]

This improvement in metallic pistons consists in the particular construction and arrangement of certain parts of such apparatus, in order to render them perfectly steam, air, or water-tight, by means of metallic packing, and capable of being used in all situations where such pistons are commonly employed. These improved metallic pistons are composed of a top and bottom plate of metal, in the ordinary manner; between which, are a peculiar combination of annular springs, intended to constitute a perfect steam or air-tight packing, and which are brought into action by means of screws, bearing both in the bed and top plate of the piston, in order to compress the system of springs, and thus, by bringing the top plate close upon the bed of the piston, cause the metallic packing to be brought into perfect contact with the interior of the cylinder in which the piston is employed.

In order to illustrate more particularly the construction of my improved metallic pistons, and to facilitate the description thereof, I have attached to these presents a sheet of drawings, in which my improved piston is exhibited complete and in detail, and having figures and letters of reference marked thereon; similar letters being placed upon corresponding parts of the apparatus in all the figures.

Fig. 1, Plate X., represents a plan or horizontal view of the piston, with the cover or top plate removed. Fig. 2, a complete side elevation, and fig. 3, a section taken vertically, through the middle of the same. The piston rod *a, a,* has the bottom plate or bed of the piston *b, b,* secured to its conical end by a cottar or key, in the usual manner; upon this bottom plate or bed, an angular spring ring *c, c,* is placed loosely, around which are placed two other spring rings *d, d,* and *e, e*; the upper ring *d,* being turned upon its interior surface to the same bevil as the upper side of the ring *c*; and the lower ring *e,* being also turned upon its interior surface to a corresponding angle, with the lower side of the spring ring *c*; thus, these two outer annular springs being accurately turned and ground to the plates *b* and *f,* form a perfect metallic packing, being pressed or kept against the interior surface of the cylinder, by the action of the annular spring *c, c.* The top plate *f, f,* is fixed upon the bed of the piston by means of the screws *g, g, g*; and thus, by enclosing the system of annular springs, keeps the whole apparatus together, and forms a perfect steam, air, or water-tight packing. In order to keep the spring packing from being injured by the action of any steam that might otherwise get into the body of the piston, the ends of the springs are furnished with small segmental pieces *h*, *h*, being turned accurately to fit corresponding recesses in the springs *d* and *e*, which will entirely prevent the admission of steam into the packing or body of the piston.

Fig. 4, is a detached plan view of the main annular spring *c*, *c*, and fig. 5, is a side elevation of the same; in which it will be seen, that it is turned somewhat excentric, and has a series of openings or mortices cut in its angular periphery, in order to assimilate all points of the spring and impart an equal action throughout its circumference.

Figs. 6 and 7, are sectional representations of the upper and lower annular springs *d* and *e*, in order to shew that their interior circumference is turned to a corresponding bevil with each angle of the spring *c*, *c*; and fig. 8, is a plan view of the same.

Having now fully described the particular object of my invention, and the manner of carrying the same into practical operation, I desire it to be understood, that I claim as my invention, the peculiar mode of constructing metallic packing for pistons, and also their particular arrangement, as shewn in the various figures of the drawing attached to these presents; that is to say, the combination of three perfect annular springs, being compressed and brought into action in the manner and for the purposes above particularly described.—[*Inrolled in the Rolls Chapel Office, June* 1839.]

Specification drawn by Messrs. Newton and Berry.

To THOMAS HORTON, *of Princes End, in the parish of Tipton, in the county of Stafford, boiler and gasometer manufacturer, and* THOMAS SMITH, *of Horseley Heath, in the same parish and county, mine agent, for their invention of improvements in the making or constructing of chains for pits, shafts, mines, or other purposes.*— [Sealed 6th March, 1838.]

THIS invention consists in the application of flat wrought iron plates to chains used for mining and other purposes, in such way that the links of such chains are more securely connected and supported, as will be hereafter particularly described.

The flat iron chains, now ordinarily used for raising coals and other minerals from pits and mines, are of such a complicated construction that they are frequently out of order, and require to be repaired, occasioning thereby great loss and inconvenience; and moreover, the mode of connecting the links is such, that these chains are apt to break, occasioning, not unfrequently, loss of life, and at all times, creating distrust and fear in the miners and others using them. Our object is to introduce at once greater simplicity and more perfect security, and with this view, we make our chains in the following manner:—

We take solid wrought iron plates, of the form shewn in the drawing hereunto annexed, and therein described in Plate X., fig. 1,—in or through which, by chains of machinery, we punch or stamp six round or square holes, as shewn in such figure by the letters A, A, A; into these holes we insert or admit the links marked B, at fig. 2, which are formed of round, flat, or square rolled iron, strongly and accurately welded; and by this arrangement the use of rivets of any kind, which is the weak part of the flat chains now in use, is altogether avoided.

The size of the links, as described in the drawing, is in just proportion to the plate therein also described; but the dimensions of both may be varied as occasion may require, and so as to adapt them to the particular purpose to which the chain is to be applied. Fig. 3, is a stay C, formed of wood, placed between the links B, B, B, with small wrought iron stubbs, towards the extremities thereof, marked D, the use of which is to keep the said links firm in their position; fig. 4, gives a lateral or edge view of a portion of the chain as put together; and fig. 5, shews the flat part of a portion of the chain in a finished state. In all these figures, the same letters are used to denote the same parts.

It is to be understood that, although we have here shewn only three square holes or openings at each end of the flat wrought iron plates, for connecting the links of the chain together with stays of wood, and iron stubbs for keeping such links in their proper position,—we do not confine ourselves to this number, neither do we limit ourselves to the precise size or form of the plates, holes, links, or stays, shewn in the annexed drawing, or to any average weight per yard of such chains when completed, as variations in this respect may be made, effecting the object of our patent, without deviating from the principle of the invention. For instance, four links instead of three may be connected with such wrought iron plates, by an equal number of holes stamped or pressed through the said plates, in the manner hereinbefore described; or the holes may be round instead of square, and the links may be round instead of square, or flat rod or hammered iron,—or any other substance effectual as a stay, may be used in the place of the wooden stays shewn by fig. 3; at present, however, we prefer the chain as shewn entire at fig. 5, both as to construction and dimensions, apprehending that, thereby, lightness may be obtained with the requisite strength.

And we would have it understood, that we lay no claim to the rolling of the iron intended to be used either for such plates or links, nor to the shape or manner of preparing the stays, nor to any of the parts separately; but what we do lay claim to, as our invention, is the application of wrought iron plates with holes stamped there through, in any form, instead of rivets or welding to the links of flat chains, to be used either for pits, shafts, mines, or other purposes, whereby the links, with or without the aid of stays made of wood or other substance, may be firmly secured and kept in the proper position for forming a flat chain, whatever the number or form of the links, or of the holes into which they are inserted.—[*Inrolled in the Rolls Chapel Office, August* 1839.]

To JOSIAH MARSHALL HEATH, *of Allan Terrace, Kensington, in the county of Middlesex, gentleman, for his invention of certain improvements in the manufacture of iron and steel.*—[Sealed 5th April, 1839.]

THIS invention consists, firstly, in the extraction of pure cast iron from certain ores of that metal, without the intervention of any earthy, alkaline, or saline matter, to form a vitreous flux, cinder, or slag; secondly, the formation of cast steel, by fusing the said pure cast iron along with malleable iron or certain metallic oxides, in such proportion as may decarburate the cast iron to a certain degree, and by completing the decarburation in a suitable cementing furnace; thirdly, the use of a certain portion of oxide of manganese in the process of converting cast iron into malleable iron, by the process of puddling; and fourthly, the use of carburet of manganese in any process whereby iron is converted into cast steel.

And in further compliance with the said proviso, I, the said Josiah Marshall Heath, do declare the manner in which my said inventions are to be performed, by the following general explanations and particular details of the several processes.

Malleable iron is at present produced either by smelting the richer iron ores with just as much charcoal or other carbonaceous matter as shall be adequate to abstract all the oxygen from the ore, and bring it into the malleable state; or by smelting the ore in contact with carbonaceous matter in such excess as to form with the metal the compound, called carburet of iron, by chemists, and cast iron by manufacturers; and then to separate the carbon by a distinct and subsequent process.

The first of these methods is that practised upon the purer native oxides of iron in the Catalan forges of the Pyrenees, in the Stück ofen of Corinthia, and in the Bloomeries of India;—the second is that practised in the blast furnaces of Great Britain upon the argillaceous ores of iron.

By the first process, malleable or bar iron, of very unequal quality in its different parts, is produced;—by the second process, a cast iron is obtained, which is contaminated to a very considerable degree with sulphur, phosphorus, arsenic, silicon, aluminum, &c., and by both processes a very large proportion of the metal is wasted into cinder under the blast, as well as in the operations of puddling and re-heating the blooms.

A pure native oxide, or carbonate of iron, is alone capable of producing a pure metal convertible into good steel; but such pure ores have been hitherto debased and deteriorated in the smelting by mixture with earthy saline or alkaline matters, under the name of fluxes, added with the intention of promoting the reduction of the metal, and of protecting it when reduced from the oxidizing influence of the blast.

I have discovered, after an extensive course of experiments, that such earthy or other mixtures are not necessary towards the reduction of the pure native oxides and carbonates of iron, and this discovery constitutes my first invention under the present letters patent. This invention consists in smelting such pure ore without the formation of any vitreous flux, slag, or cinder, in manner as follows:—

I commence the operation by filling progressively my blast furnace with coke, charcoal, or other equivalent fuel, leaving the tap-hole open, that the flame of the fuel, urged by the blast, may play in all directions, downwards as well as upwards, so as to bring the whole interior of the furnace into a uniform state of incandescence; and whenever the furnace is thus filled with ignited fuel, I close the tap-hole, and immediately throw into the mouth of the furnace twenty pounds of ore for every hundred pounds of fuel, and I continue to charge the furnace at this rate until such time as it is calculated that three or four hundred weight of fluid iron are collected in the hearths, at which time I tap the furnace and run off the melted metal into pigs.

After this first discharge or casting, I begin to add the ore, at the rate of twenty-five pounds for every hundred pounds of fuel, and continue to charge the furnace at this rate during a period of twelve hours, at which time I tap and run off a second casting of pig iron. After this second discharge I add ore at the rate of thirty pounds for every hundred pounds of fuel, during the third working period of twelve hours; and thus, in each successive period of twelve hours, I increase the burthen of ore at the rate of five per cent. of the weight of the fuel, till, eventually, the proportion of ore shall amount to about sixty-five or seventy pounds for every hundred pounds of fuel. By proceeding in this way, and by throwing in the ore, merely reduced to the size of peas, or thereabouts, but not roasted, I find that, if the furnace be well attended to by the workmen, it will turn out about fifty pounds of pure pig iron for every hundred pounds of fuel that are consumed.

I prefer to run the fused metal into iron moulds, because I have found that when it is run into sand, as is commonly practised by the iron smelters, it is apt to get covered with a coat of silicious matter, and is thereby contaminated and subject to waste in the subsequent process of conversion into malleable iron or steel; but I do not claim running the iron into iron moulds as any part of my invention.

Having by the said process obtained a pure cast metal, or a simple carburet of iron, uncontaminated with the sulphur, phosphorus, silicon, and other metalloids present in ordinary cast iron, I next proceed to convert that carburet into steel of any degree of hardness, which conversion I perform as follows:—I first melt the said cast iron in a cupola furnace, by the heat of coke, as free from sulphur as possible; or by mixture of such coke and anthracite, or in certain localities by wood charcoal. But in all cases I use no more fuel than is merely requisite to melt the iron, so that the oxygen of the blast shall serve to burn away the carbon of the carburet in a considerable degree; while I neutralize or remove a further portion of the carbon by the addition of scraps of metallic iron, or by the oxides of iron or of manganese, always taking care not to decarburate the metal to such a degree as to render it infusible, but to leave about as much carbon in it as exists in cast steel.

For the purpose of producing a superior article of cast steel from my said pure cast iron, obtained by the above described process, I introduce sesquioxide of manganese, or peroxide, which had been previously ignited, in quantities not exceeding five per cent., into the cupola; while I employ no more fuel than the blast can readily burn into carbonic acid, for otherwise the excess of the carbonaceous fuel would deoxidize the manganese, nullify its decarburating action upon the cast iron, and thus prevent it from reducing the metal to that lower stage of carburet which constitutes cast steel. I also sometimes introduce into the cupola for the same decarburating purpose, a portion not exceeding five per cent. of chrome ore, which consists of the oxides of chrome and iron, or a like proportion of pure oxide of iron. When the decarburation has been carried on in the cupola to the proper pitch, as has been already defined, the steely metal is to be run out and cast into iron moulds. The ingots thereby formed are now to be converted into steel of any desired degree of mildness, by a further process of decarburation, which consists in stratifying the said ingots along with peroxide of iron or peroxide of manganese, without charcoal, in a steel cementing, or other suitable furnace; such furnace being lined with iron, if it is constructed of fire bricks, or stone, to prevent the action of the peroxides upon the stone or bricks of the furnace;—the ingots are to be here subjected to a cementing heat for a certain period, proportional in duration to the softness required in the metal. I further propose to improve the quality of malleable or bar iron by adding to the pig or plate iron in the puddling furnace, while in fusion, from one to five per cent. or thereabouts, of any pure oxide of manganese, but without mixture of any other substance,—the sesqui oxide being that which I prefer.

Lastly, I propose to make an improved quality of cast steel, by introducing into a crucible, bars of common blistered steel, broken as usual into fragments or mixtures of cast and malleable iron, or malleable iron and carbonaceous matters along with from one to three per cent. of their weight of carburet of manganese; and exposing the crucible to the proper heat for melting the materials which are, when fluid, to be poured into an ingot mould in the usual manner;—but I do not claim the use of any such mixture of cast and malleable iron, or malleable iron and carbonaceous matter as any part of my invention, but only the use of carburet of manganese in any process, for the convertion of iron into cast steel.

I claim, first, the reduction of the pure native oxides and carbonates of iron into cast iron, without the intervention of flux or the production of cinder; second, the production of cast steel by decarburating cast iron to a certain degree in a cupola or other suitable furnace or crucible, with the addition of malleable iron or certain metallic oxides, and completing the decarburation to the required degree by subsequent cementation, in a suitable furnace, with an oxide of manganese, or an oxide of iron, without any admixture of carbonaceous matter; third, the employment of oxide of manganese alone in the puddling of cast iron; and fourth, the employment of carburet of manganese in preparing an improved cast steel.—[*Inrolled in the Rolls Chapel Office, October*, 1339.]

Specification drawn by Dr. Ure.

To Luke Hebert, *of Hampstead-road, in the county of Middlesex, civil engineer, and* James Don, *of Lower James-street, Golden-square, in the city of Westminster, gentlemen, for their invention of certain improvements in engines and other machinery, employed in the construction of steam vessels and steam carriages, a portion of which improvements is applicable to other purposes; and part of which improvements were communicated by a foreigner.*—[Sealed 28th February, 1833.]

The subjects of this patent are described under three heads:—first, the construction of rotary steam-engines, in which are introduced certain modes of packing the ends of thin cylinders to render them steam tight; second, peculiar arrangements of tubes for the flow of water, and for the passage of flame and heated air through tubular steam boilers; and third, a mode of drawing off and condensing the eduction steam from behind the piston, both for locomotive carriages and steam vessels.

The patentees' explanations of these improvements extend to a very considerable length, and are illustrated by a great number of figures; but we discover little if any novelty in any part of them.

In the first place, a stationary cylindrical steam chamber has a rotary cylinder revolving concentrically within it, and carrying the vanes, which are to act as pistons. An excentric arc is fixed within the steam cylinder, to act as a steam stop; and two vanes are projected from recesses in the rotary cylinder, in radial directions, by means of springs behind them, which cause the outer ends of the vanes, as they revolve, to be at all times in contact with the internal periphery of the steam cylinder, or of the arched steam stop.

It will be of course understood, that the steam is admitted into the cylinder by an opening on one side, and after forcing round the piston or vane, escapes by another opening on the opposite side.

The ends of the steam cylinder are secured by disc formed plates, and in order to render their joints perfectly steam-tight, expanding rings, formed by segments of metal, are applied to the joints and pressed by springs, much in the same way as Barton's pistons are packed by segments of metal.

The improved boilers are formed by combinations of tubes for the passage of the water, with other tubes through them for the flues which conduct the smoke and heated vapour from the furnace. Some of the tubes range longitudinally, others transversely; some are horizontal, others vertical; but it would be impracticable to explain their arrangements, in such a way as would be clearly understood, without a series of figures, and this we do not consider necessary, as no particular advantage is pointed out as arising from this construction, nor do we discover any.

The third feature consists in the adaptation of a tube to the eduction aperture, which is sufficiently large to allow the main axle of the paddle wheels of a vessel, or of the running wheels of a locomotive engine, to pass through and revolve within it, and upon the main axle; within the tube, a fan wheel is adapted, to be fixed by a clutch, so that as the axle revolves, the fan may produce a partial vacuum within the tube, and thereby assist the exhaustion and condensation of the eduction steam.—[*Inrolled in the Inrolment Office, August,* 1833.]

To EDWARD FORD, *of Liverpool, in the county of Lancaster, builder, for his invention of certain improvements in conducting the manufacture of salt cake or sulphate of soda, and hydrochloric or other acids and alkalies, or other chemical processes, wherein deleterious vapours are given off; and in the erection of furnaces and works connected therewith.*—Sealed 8th March, 1839.]

THESE improvements in conducting the manufacture of salt-cake or sulphate of soda, and hydrochloric or other acids and alkalies, or other chemical processes, wherein deleterious vapours are given off, and in the erection of furnaces or works connected therewith,—consist in removing the furnaces and other works, whereby such chemical processes are effected, from the neighbourhood of vegetation; and erecting and working the same afloat upon the seas or such rivers as shall be available for the purpose, whereby the destructive vapours arising and given off, during the processes, shall be sufficiently removed from land.

For this purpose, I employ a vessel or flotilla, in or upon which I erect or construct the furnaces and works necessary for the purpose, without in any manner deviating from those usually employed in such chemical processes, excepting having them all afloat in the vessel, flotilla, or raft, and having that moored a sufficient distance from land, (during the working) as to remove entirely all deleterious vapour from the surface of vegetation. The vessel or flotilla should be lined with lead, at least, under the furnaces, having its sides or edges turned up, so as to be hollow upon the top surface, to secure the vessel from injury in case of any leakage from the furnace. I would here remark, that the vessel or flotilla must be "trimmed" when working, so as to keep the bed of the furnace as level as practicable. It will also be evident, that the situation and distance from land at which the vessel must be moored when working, will entirely depend upon the character of the coast, and upon the varying circumstances of the wind;—as for instance, if the coast be level and the wind blowing off shore, the processes may be carried on as near as practicable. And I would further remark, in conclusion, that owing to the well known affinity for moisture of such vapours, I have found it practicable, that the nearer the land such flotilla can be moored with safety, the lower the chimney of the furnace may be.

Having now particularly ascertained and described the nature of my said invention, and the manner in which the same is to be performed, I desire it to be understood, that I claim as my invention, and which is secured to me by the above recited letters patent, the peculiar method of conducting such processes afloat, in the manner and for the purposes herein set forth.—[*Inrolled in the Rolls Chapel Office, September*, 1839.]

Specification drawn by Messrs. Newton and Berry.

To THOMAS HUGHES, *of High Holborn, in the County of Middlesex, Truss maker, for an improvement in stocks, cravats, and stiffeners.* [Sealed November 7th, 1837.]

THIS invention is for constructing an internal elastic frame to stocks, cravats, or stiffeners, whereby greater ease and comfort is given to the wearer, and the said cravats, stocks, or stiffeners will retain their shape better than those now in ordinary use.

The figure in plate XI., represents a perspective view of the frame of a stock or stiffener, which consists of two bent springs made of finely tempered metal. These two springs are connected together at the back part, by two smaller springs, which serve to give a greater degree of elasticity to the stiffener.

In the above arrangement the parts are constructed and put together in such a manner, that the cravat, stock, or stiffener, may be made to have a great degree of elasticity, and at the same time it will always assume its original shape when not pressed on by the chin. The wearer will also find that in stooping or sitting long to write or read, the small bent springs, placed behind, will yield to a slight degree of pressure, and will not offer any unpleasant pressure to the throat, as is sometimes the case with stocks or stiffeners of the present construction. In conclusion, the patentee says,—having thus explained my invention, and the manner of combining the same, I wish it to be understood, that I do not claim any of the parts separately, and it should be stated that the frame so made, is to be covered with silk or other fabric, according to taste. And I claim as my invention, the mode of constructing the frames of stocks, cravats, or stiffeners, as above described.—[*Inrolled in the Inrolment Office, May* 1838.]

Original Communication.

EXPERIMENTS ON FERMENTATION;

WITH SOME GENERAL REMARKS.

By Andrew Ure, M.D. F.R.S.[*]

A dispute having taken place between some distillers in Ireland and officers of excise, concerning the formation of alcohol in the vats or tuns, by spontaneous fermentation, without the presence of yeast, the Commissioners of Excise thought fit to cause a series of experiments to be made upon the subject in a convenient laboratory, mounted for the purpose within their premises in Broad-street. These experiments were entrusted to the immediate care of Messrs. Voyce and Williamson, two surveyors-general of great experience in distilleries, and they were placed under my general superintendence.

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[*] From the pressure of business before the Chemical Section of the British Association, at Birmingham, on Thursday, Aug. 29th, Dr. Ure did not read this paper, but merely gave a general summary of its contents.

The operations commenced on the 30th September, 1837, upon the following mixed materials :—

2 Bushels of barley, weighing	104 lbs.	6	oz.
½ Bushel of oats	20 „	14½	„
½ Bushel of malt	21 „	14½	„
Total 3 Bushels, weighing	147 „	3	„

The grains were crushed in a proper malt mill.—Into the details of this first experiment it is needless to enter, because the false bottom of the mash tub was so imperfectly made, that a clear wort was not obtained; but, notwithstanding this, vinous fermentation spontaneously took place, with an attenuation of 12.6 degrees, and an alcoholic product equal to one gallon of proof spirit.

An experiment was made on the 6th of October, with the following mixture of corn :—

2 Bushels of barley, weighing	100 lbs.	5	oz.
½ Bushel of malt	21 „	7	„
½ Bushel of oats	20 „	12	„
Total 3 Bushels, weighing	142 „	8	„

The bruised corn was wetted with 26 gallons of water, at the temperature of 160° F., and after proper stirring, had 8 gallons more of water added to it, at the average temperature of 194°. The mash was again well stirred, and at the end of 45 minutes, the whole was covered up, having at that time a temperature of 138° F. Three hours afterwards, 16 gallons of wash only were drawn off,—being considerably less than should have been obtained, had the apparatus been constructed somewhat differently, as shall be presently pointed out. The gravity of that wash was 1.060; or, in the language of the distiller, 60 degrees. After a delay of two hours more, 20 additional gallons of water at the temperature of 200° were introduced, when the mash was well stirred, and then covered up for two hours; at which period, 23 gallons of fine worts, of specific gravity, 1.042, were drawn off. An hour afterwards, 12 gallons of water, at 200°, were added to the residual grains; and in an hour and a half, 11 gallons of wort, of the density 1.033, were obtained. Next morning the several worts were collected in a new mash tun. They consisted of 48 gallons of the temperature 80°, and of a specific gravity 1.0465, when reduced to 60° F. Being set at 80°, fermentation soon commenced; in two days, the specific gravity had fallen to 1.0317; in three days, to 1.018; in four days, to 1.013; and in five days, to 1.012; the temperature having at last fallen to 78° F. The total attenuation was therefore 34½ degrees, indicating the production of 3.31 gallons of proof spirit; while the produce by distillation in low wines, was 3.22; and by rectification in spirits and feints, it was 3.05. The third experiment was commenced on the 12th October, upon a similar mixture of corn to the preceding. Forty-eight gallons of worts, of 1.043 specific gravity, were set at 82° in the tun, which next day was attenuated to 1.0418; in two days, to 1.0202; in three days, to 1.0125, and in five days, to 1.0105; constituting in whole, an attenuation of 32½°, which indicates the production of 3.12 gallons of proof spirits; while the produce of the first distillation was 2.93 in low wines, and that of the second, in feints and spirits, was 2.66. In these experiments, the wash when fermenting most actively, seemed to simmer and boil on the surface, with the emission of a hissing noise, and the copious evolution of carbonic acid gas. They prove beyond all doubt, that much alcohol may be generated in grain worts, without the addition of yeast, and that also at an early period; but the fermentation is never so active as with yeast, nor does it continue so long, or proceed to nearly the same degree of attenuation.

I was never satisfied with the construction of the mash tun used in these experiments, and had accordingly at the very commencement of the operations, suggested another form, by which the mash mixture could be maintained at the proper temperature during the mashing period. It is well known to chemists, that the diastase of malt is the true saccharifying ferment which converts the fecula or starch of barley and other corn, into sugar; but it acts beneficially only between the temperatures of 145° and 168° F.* When the temperature falls below the former number, saccharification languishes, and when it rises much above the latter, it is entirely checked. The new mash tun was made of sheet zinc, somewhat wider at bottom than at top; it was placed in a wooden tun, so much larger, as to leave an interstitial space between the two of a couple of inches at the sides and bottom. Through this space a current of water at 160° was made to circulate slowly during the mashing period. Three bushels of malt, weighing 125 lbs. 3 oz., were wetted with 30 gallons of water, at 167°; and the mixture being well agitated, the mash was left covered up at a temperature of 148° during three hours, when 19 gallons of fine worts were drawn off, at the specific gravity of 1.0902, or 90.2°. Twenty gallons more water at 167° were then added to the residuum, which afforded after two hours, 28 gallons of wort, of the gravity 1.036. Twelve gallons of water at 167° were now poured in, which yielded after other two hours, 15 gallons at the gravity 1.0185. Forty gallons of fine worts at 1.058 gravity, and 68° temperature, were collected in the evening of the same day, and let down into the tun with 5 per cent. of yeast. The attenuation amounted in six days to 54°. The third wort of this brewing amounting to 15 gallons, being very feeble, was mixed with 7 gallons of the first and second worts, put into a copper, and concentrated by boiling to 11 gallons, which had a gravity of 1.058 at 60° F. They were separately fermented with 5 per cent. of yeast, and suffered an attenuation of $48\frac{1}{2}°$. The produce of spirits from both, indicated by the attenuation, was 5.36 gallons; the produce in low wines was actually 5.52, and that in spirits and feints was 5.33, being a perfect accordance with the excise tables.

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* M. Raspail's observations upon diastase, are entirely erroneous, and cannot be allowed to invalidate the facts adduced by Payen, Persoz, and Guerin Varry. In fact were Raspail correct, wheat flour boiled with water should immediately form sugar.

The next experiments were made with the view of determining at what elevation of temperature, the activity or efficacy of yeast would be paralyzed; and how far the attenuation of worts could be pushed within six hours, which is the time limited by law for worts to be collected into the tun, from the time of beginning to run from the coolers. When worts of the gravity 1.0898, were set at 96° F., with 5 per cent. of yeast, they attenuated 26.9° in six hours; worts of 1.0535 gravity set at 110° with 5 per cent. of yeast, attenuated 16° in about five hours; but when worts of 1.0533 were set as above at 120°, they fermented neither then, nor when allowed to cool, shewing that the activity of the yeast was destroyed. When fresh yeast was now added to the last portion of worts, the attenuation became 5.8° in two hours, and 28.4° in three hours; shewing that the saccharine matter of the worts still maintained its fermentative faculty. Malt worts being brewed as above specified, were set in the tun, one portion at a temperature of 70° with a gravity of 1.0939, and 5 per cent. of yeast, which attenuated 66° in three days; other two portions of the same gravity were set at 120°, with about 10 per cent. of yeast, which underwent no fermentative change or attenuation in six hours, all the yeast having fallen to the bottom of the tuns. When these two samples of worts were allowed however to cool to from 74° to 72°, fermentation commenced, and produced in two days an attenuation of about 79°. It would appear from these last two experiments, that yeast to the amount of 5 per cent. is so powerfully affected by strong worts heated to 120°, as to have its fermentative energy destroyed; but, that when yeast is added to the amount of 10 per cent., the five parts of excess are not permanently decomposed, but have their activity merely suspended till the saccharine liquid falls to a temperature compatible with fermentation.

Yeast, according to my observations, when viewed in a good achromatic microscope, consists altogether of translucent, spherical, and spheroidal particles, each of about one six-thousandth part of an inch in diameter. When the beer in which they float is washed away with a little water, they are seen to be colourless; their yellowish tint, when they are examined directly from the fermenting square, or round of a porter brewery, being due to the infusion of the brown malt. The yeast of a square newly set, appears to consist of particles smaller than those of older yeast, but the difference of size is not considerable.

The researches of Schulze, Cagniard-de-la-Tour, and Schwann, concur to shew that the vinous fermentation and the putrefaction of animal matters, (processes which have been hitherto considered as belonging entirely to the domain of chemical affinity,) are essentially the results of an organic development of living beings. This position seems to be established by the following experiments:—1. A matrass or flask, containing a few bits of flesh, being filled up to one-third of its capacity with water, was closed with a cork, into which two slender glass tubes were cemented air-tight. Both of these tubes were passed externally through a metallic bath kept constantly melted at a temperature approaching to that of boiling mercury. The end of one of the tubes on emerging from the bath, was placed in communication with a gasometer. The contents of the matrass were now made to boil briskly, so that the air contained in it and the glass tubes was expelled. The matrass being then allowed to cool, a current of atmospherical air was made constantly to pass through it from the gasometer, while the metallic bath was kept constantly hot enough to decompose the living particles in the air. In these experiments, which were many times repeated, no infusoria or fungi appeared, no putrefaction took place, the flesh underwent no change, and the liquor remained as clear as it was immediately after being boiled.

As it was found very troublesome to maintain the metallic bath at the melting pitch, the following modification of the apparatus was adopted in the subsequent researches.—A flask of three ounces capacity, being one-fourth filled with water and flesh, was closed with a tight cork secured in its place by wire. Two glass tubes were passed through the cork; the one of them was bent down and dipped at its end into a small capsule containing quicksilver covered with a layer of oil; the other was bent on leaving the cork first into a horizontal direction, and downwards for an inch and a half, afterwards into a pair of spiral turns, then upwards, lastly horizontal, whence it was drawn out to a point. The pores of the cork having been filled with caoutchouc varnish, the contents of the flask were boiled till steam issued copiously through both of the glass tubes, and the quicksilver and oil became as hot as boiling water. In order that no living particles could be generated in the water condensed beneath the oil, a few fragments of corrosive sublimate were laid upon the quicksilver. During the boiling the flame of a spirit lamp was drawn up over the spiral part of the second glass tube, by means of a glass chimney placed over it, so as to soften the glass; while the further part of the tube was heated by another spirit lamp to prevent its getting cracked by the condensation of the steam. After the ebullition had been kept up a quarter of an hour, the flask was allowed to cool and get filled with air through the hot spiral of the second tube. When the contents were quite cold, the end of this tube was hermetically sealed, the part of it between the point and the spiral was heated strongly with the flames, and the lamps were then withdrawn. The matrass contained now nothing but boiled flesh and gently ignited air. The air was renewed occasionally through the second tube, its spiral part being first strongly heated; its point then broken off and connected with a gasometer, which caused the air to pass onwards slowly, and escape at the end of the first tube immersed in the quicksilver. The end of the second tube was again hermetically closed, while the part interjacent between it and the spiral was exposed to the spirit flame. By means of these precautions, decoctions of flesh were preserved during a period of six weeks in a temperature of from 14° to 20° R. (63½° to 77° F.) without any appearance of putrefaction, infusoria, or mouldiness; on opening the vessel however the contents fermented in a few days, as if they had been boiled in the ordinary manner. In conducting such researches, the greatest pains must be taken to render the cork and junctions of the glass tubes perfectly air-tight.

The following more convenient modification of the experiment, but one equally successful and demonstrative, was arranged by F. Schulze. The glass tubes connected with the flask, were furnished each with a bulb at a little distance from the cork; into one of which globes caustic alkaline lye being put, and into the other strong sulphuric acid, air was slowly sucked through the extremity of the one tube, while it entered at the other, so as to renew the atmosphere over the decoction of flesh in the flask.

In another set of experiments, four flasks being filled with a solution of cane-sugar, containing some beer yeast, were corked, and plunged in boiling water till they acquired its temperature. They were then taken out, inverted in a mercurial bath, uncorked and allowed to cool in that position. From one-third to one-fourth of their volume of atmospherical air was now introduced into each of the flasks;—into two of them, through slender glass tubes kept red hot at a certain point; into the other two, through glass tubes not heated. By analysis it was found that air thus heated contained only 19.4 per cent. of oxygen instead of 20.8; but to compensate for this deficiency, a little more air was admitted into the two flasks connected with the heated tubes than into the two others. The flasks were now corked and placed in an inverted position in a temperature of from 10° to 14° R. (54½° to 63½° F.) After a period of from 4 to 6 weeks it was found that fermentation had taken place in both of the flasks which contained the non-ignited air, for in loosening the corks, some of the contents were projected with force; but in the other two flasks there was no appearance of fermentation either then, or in double the time.

As the extract of nux vomica is known to be a poison to *infusoria* (animalcules), but not to vegetating mould, while arsenic is a poison to both,—by these tests it was proved that the living particles, instrumental to fermentation, belonged to the order of plants of the confervoid family.

Beer yeast, according to Schwann, consists entirely of microscopic fungi in the shape of small oval grains of a yellowish white colour, arranged in rows oblique to each other. Fresh grape must contains none of them, but after being exposed to the air at 20° R. for 36 hours, similar grains become visible in the microscope, and may be observed to grow larger in the course of an hour, or even in half that time. A few hours after these plants are first perceived, gas begins to be disengaged. They multiply greatly in the course of fermentation, and at its conclusion subside to the bottom of the beer in the shape of a yellow white powder.

Scientific Adjudication.

FISHER *v* DEWIC.

Court of Common Pleas.—Before Mr. Justice Coltman.

Counsel for Plaintiff, Serjeant Wilde, Sir F. Pollock, and Mr. Hoggins.—For Defendant, the Attorney-general, Mr. Earle, and Mr. Whiteman.

This was an Action for an assumed piracy on the patent right granted to "*William Sneath, of Ison Green, in the County of Nottingham, for his invention of improvements in machinery for the manufacture of bobbin net lace,*" (see Vol. IX. of our present Series, p. 207,) the patent having become the property of the plaintiff.

Serjt. Wilde in opening the case stated, that the invention was a mode of producing in bobbin net machinery, upon the meshes of bobbin net lace, certain spots arranged in various orders or devices, for the purpose of ornamenting the lace which had never before been produced by any such description of machinery, but had only been effected previously to the patent by hand embroidery.

It would be in vain to attempt following the learned counsel in his explanation of the complicated construction of this improved machinery and its modes of working, without laying also before our readers the whole of the numerous drawings which are appended to the specification; our report, however, above referred to, will sufficiently point out the general features of novelty of arrangement intended to be secured under this patent, which consist in the adaptation of certain pieces of mechanism to be appended to the ordinary lace making machinery, for the purpose of enabling such machinery to work the threads occasionally into spots upon the meshes of the lace, as the net is forming. The complaint against the defendant was not that he had exactly copied the arrangement of machinery set out in the patentee's specification, but that having carefully observed the positions of the threads and the manner of combining them to produce spots upon the fabric, he had adopted other arrangements of the like machinery and had thereby produced a similar result, viz. "spotting," which had not been done by such machinery until the patentee pointed out the mode by which it could be effected; for instance, the plaintiff pulled up the threads at the required parts by hooks,t—he defendant moved them forward by pushers, and then by other common movements of the machinery, tied up the threads upon the fabric in the forms of embroidered spots.

The evidence for the plaintiff proved that Grundy and Barton, both workmen employed by plaintiff, got up a ladder and looked in at a window in the defendant's factory, and there saw and heard machinery at work, making spotted lace, which they declared to have the same general motions as the plaintiff's.

The manners of effecting the object both in plaintiff's and defendant's machines, were described by working models in Court.

Mr. John Heathcoat, M. P., described the models which had been adopted for producing selvages and certain patterns on lace, by employing pushers to select certain threads;—the other movements of the machinery are common. In the plaintiff's machine certain threads are drawn off the bobbins by hooks for the purpose of giving the necessary quantity of thread, and these accumulations of thread are lodged upon points, and by shogging the warps they become interwoven in the fabric. In defendant's machine, the threads are drawn off the bobbins by being bent over a bar. In plaintiff's, the whole accumulation of threads is formed round the points; in defendant's, the slackened threads are passed round two warp threads, and make the spot by racking motions. In the plaintiff's, the taking up points remain inactive during the making of the spot; in defendant's, the taking up points go through the same motions as in ordinary taking up to lift the spot to its place in the net. Ordinary points would not keep the threads spread out for the spot in the plaintiff's machine, therefore additional flat points are brought up for holding up the spot, whilst the making of the net goes on.

Witness has had great experience, but never knew spots made upon lace in such a way before plaintiff effected it;—considers the invention useful and valuable.

Mr. Cottam and Mr. Bramah described the constructions of the two machines, but could not speak to the originality of any of their parts, as they had no knowledge of lace machinery before they were engaged in this cause.

Mr. Nunn is a lace maker of great experience; is of opinion that the plaintiff and defendant's machines are the same in principle; that it might be possible to make spots on bobbin net by machinery without infringing Sneath's—considers that twisting the bobbin threads round two warp threads, is the essential pattern of novelty—does not think that spots could be made without so doing.

Mr. Freeman is a patentee of lace machinery for spotting,—but his machinery is on what is called the traverse warp principle; plaintiff's spot is formedby the bobbin thread,—witness's by the warp thread. In plaintiff's machine the bobbin threads traverse diagonally;—in witness's, the warp threads traverse diagonally, and the spot is formed by twisting two threads round two.

Mr. Roberts, an engineer, considered the essential features of the two machines alike, though some of the movements are different; the difference in their operations are, that in the plaintiff's, the spotting threads are mounted on hooks above; in defendant's, the twist is formed on the threads below and carried up.

Robert Levers, a workman of plaintiff's, stated that plaintiff has at work five machines made on Sneath's principle, and twenty on the defendant's, by which it may be inferred that the latter is an improvement on the former; and Bacon, a workman, had worked defendant's machine in plaintiff's factory for three years and upwards.

Mr. Henry Levers (Alderman of Nottingham) had not seen spotted lace in any quantity until shewn him by Sneath.

The defendant's objections to the plaintiff's patent (which the new law calls upon him to state) were, 1st. That the machinery claimed was not truly the invention of the patentee; 2nd. That it was not invented at the time the patent was granted; 3rd. That parts of the machinery were not new; 4th. That certain parts enumerated were useless; 5th. That the specification was not sufficiently descriptive; 6th. That the selecting pushers were used by others before the patent; 7th. That certain articles enumerated were not sufficiently described; 8th. That the arrangement was stated to be capable of adaptation to other constructions of lace-making machines, but that in fact, there were many kinds of lace-making machines in use, to which it was not applicable. Several other trivial objections were also stated; and, lastly, That the title of the patent and its specification did not correspond.

The Attorney-general, for defendant, objected that the title of the patent is for *machinery for making bobbin net lace*, but that the invention is an improved method of spotting bobbin net lace; for, in fact, the machinery for making the bobbin net is quiescent at the time that the parts are working to produce the spot. Mr. Earle and Mr. Whiteman argued on the same point of objection.

Mr. Justice Coltman considered the objection not simply a point of law, but also of fact, and therefore submitted it to the Jury.

Mr. Berry had been for many years conversant with various constructions of machinery for making lace,—having been in the practice of making drawings of various constructions of lace machinery for specifications of patents, under the direction of his present partner, Mr. Newton. The witness then described the plaintiff's and defendant's machines; the objects of both were alike to produce spots in the fabric of bobbin net lace, but their constructions and modes of working were very different; that they were different modes of adapting old and well known agents, commonly employed by lace makers, for producing selvages and devices in the fabric of bobbin net.

Mr. Hawkesley is well acquainted with lace machinery,—pointed out that certain essential parts of the plaintiff's machinery were not found in that of the defendant's; that one part only existed in both, but that the machines were essentially different, and described the difference in their construction and action. Believes that manufacturers are in the habit of keeping their rooms closed against the intrusion of strangers.

Mr. Birkin is a lace maker,—has twisted the bobbin threads round two of the warp threads, for making spotting, before the year 1830—is accustomed to keep his shop closed from strangers—knows both Sneath's and Dewic's machines—the mode of spotting is essentially different in the two machines—no parts have any resemblance but the pushers, and those have different actions owing to different arrangements, and an additional locker bar.—The witness has more than forty machines on his own patent principle; the plaintiff claims a right to witness's improved arrangement, but has taken no steps to assert that right, and continues to purchase of witness his spotted lace.

Mr. Holbrook has known selecting pushers used in lace-making for sixteen years past, and threads extended by forks—considers the two processes employed by plaintiff and defendant for making spots, as totally different—witness made spots on lace by the bobbin threads in 1827, by two bobbin threads passed round the two warp threads, particular carriages being selected by pushers, and the spots taken up by the ordinary points.—Whilst the spotting operation went on, the bobbins for making the mesh stood still.— Witness produced spotted lace made in a circular bolt machine in 1827.

Mr. Hoyles employed Holbrook,—in 1827 communicated to him a plan for making spots on lace from the bobbin threads; to the old machine he added extra pusher bars.

Mr. Hill saw some of the spotted lace made by Holbrook at Hoyle's factory.

Mr. Topham proved that he made parts of the machine in 1827, for spotting, and produced that part of the machine called the pusher bars, and explained their mode of working. These pusher bars had been thrown aside for years, as the making of the spotted net was a slow process, as the quantity of plain net made rapidly by the same machine, paid better. A considerable quantity of the spotted net had been made at that time, but it was not then in demand, and was, in 1831, sold or bartered away in exchange for other goods and money to some French woman, a lace dealer.

Mr. Moore superintended Mr. Bradley's machines on the traverse warp principle, in which the spotting threads were selected by pushers and other threads carried round them; the bars were moved by a wheel, and by these machines spotted lace was made in 1830 and 1831.

Mr. Serjt. Wilde contended that spotted lace had not been so made by bobbin net machinery before the date of the plaintiff's patent, as to effect the novelty and originality of Sneath's invention; for the experiments made by the machine, the broken parts of which had been produced, must have been abortive, or they would have continued to exercise so valuable an invention (as in the patent cause of Jones *v.* Pearce, for iron wheels) and it could not be proved that any of the lace said to have been made was ever sold—it was merely bartered away, in fact, it had been found defective and had been crammed in with a lot of other goods, and sent abroad, and when it arrived there no doubt the unfortunate lace dealer found she had been cheated.

It was fully proved by the most respectable witnesses, that spotted lace made by a bobbin net machine, had not been known in the market until Sneath made his invention; and that modification of arrangement subsequently made by Dewic, was clearly on the same principle as that of Sneath's, and therefore he trusted the Jury would not have the slightest hesitation in giving his client their verdict.

After the Judge had briefly summed up, referring to the points of objection raised against the plaintiff's patent, and his view of the law in those cases, he left it to the Jury to consider their verdict, which they returned for the plaintiff, with nominal damages.

Novel Invention.

NEW MODE OF PRODUCING COPIES OF MEDALS AND METALLIC ORNAMENTS.

A curious, and we conceive, extremely valuable discovery has been lately made by a gentleman named Spencer, of Liverpool, by which he appears to be enabled to obtain fac-simile copies in copper, of medals and other subjects in relief, by means of voltaic electricity. We have perused a paper read before the Liverpool Polytechnic Society, in which a variety of experiments are detailed relative to this discovery, some of which appear to have been highly satisfactory; whilst others not so successful have yet developed facts which may be eminently useful in directing the adaptation of this discovery to various departments of the arts.

Without following Mr. Spencer through the several experiments which he has detailed to the Society, we may state generally certain results at which he has arrived, and the means by which he obtained them.

It appears that from a long investigation of the phenomena of electro-chemical science, Mr. Spencer perceived that voltaic electricity afforded the means of conducting copper from a solution of sulphate of copper in the voltaic battery, and depositing it in mass in its metallic state upon other metallic surfaces, placed within the range of the electric action. To render this process useful, it is necessary to bring the operation completely under command, in order that the metal deposited may be made to arrange itself in such forms as shall be conducive to the production of works of art.

In order to effect this, attempts were made by depositing the copper, through the voltaic agency, in raised lines or ridges upon the surfaces of metal plates, which might be capable by their relief, of being employed for surface printing (as stereotype plates). This was partially accomplished, but the most successful attempts appear to have been the production of fac-simile copies of medals.

The means adopted in this case, were two discs of sheet lead, and having the medal placed between them, were submitted to pressure, either in a stamping or rolling press, which caused the lead to take the counter impressions of the two faces of the medal, each as a matrix. In these leaden moulds, when so prepared, copper wires from the voltaic battery were inserted, and the two faces, or hollow matrixes, being then put together, and the galvanic process carried on, the copper became deposited in a few days in the mould, and ultimately filled the mould, producing eventually a mass of deposited metal in the identical shape and exact fac-simile of the original medal.

If the moulds were separately employed, of course the two faces of the medal would be obtained separately, and might after a thin coating or shell had been deposited in each, be backed or filled up by some easily fusible metal.

When copies are to be taken from bronze or other figures, it is proposed to take casts in plaster, and to coat the internal surfaces of these casts with leaf gold. Or metallic foils may be pressed on to the external surface of the figure, and its shape so taken,—which moulds being submitted to the voltaic process, as above stated, the copper will be deposited in the exact form of the original.

It will be perceived that we have not attempted to go into any minute details of the manner of conducting this curious operation, or of explaining its extensive adaptations; we have not yet seen any of its productions, but we hope to be enabled shortly to lay before our readers further particulars of the discovery, and of its useful appropriation to many of the purposes of art to which we conceive it will be found applicable, and form a new and valuable feature in practical science.

As it may be more satisfactory to give the author's own words as to his process, we quote a portion of his paper in which he says, "In September, 1837, I was induced to try some experiments in electro-chemistry, with a single pair of plates, consisting of a small piece of zinc and an equal sized piece of copper, connected together with a wire of the latter metal. It was intended that the action should be slow; the fluids in which the metallic electrodes were immersed, were in consequence separated by a thick disc of plaster of Paris. In one of the cells was sulphate of copper in solution, in the other a weak solution of common salt. I need scarcely add, that the copper electrode was placed in the cupreous solution—I was desirous that no action should take place on the wire by which the electrodes were held together, and to attain this object I varnished it with sealing wax varnish, but in so doing I dropped a portion of the varnish on the copper that was attached."

"The operation was conducted in a glass vessel; I had, consequently, an opportunity of occasionally examining its progress, when after a lapse of a few days, metallic crystals had covered the copper electrode;—with the exception of that portion which had been spotted with varnish, I at once saw that I had it in my power to guide the metallic deposition in any shape or form I chose, by a corresponding application of varnish or other non-metallic substance."

"I had been long aware (of what every one who uses a sustaining galvanic battery with sulphate of copper in solution must know) that the copper plates acquire a coating of copper from the action of the vallens, but I had never before thought of applying it to a useful purpose."

Then follows the details of experiments, the results of some of which we have stated above, and hope to return to this subject with further particulars of the process and its achievements, on a future occasion.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from p. 412, Vol. XIV.)

March 26, 1839.

The President in the Chair.

" Description of a Sawing Machine for cutting off Railway Bars."

By Joseph Glynn, M. Inst. C. E.

The advantage of having the ends of the railway bars cut as nearly square as possible, that they may truly abut against each other, is so great, that many attempts have been made to effect it. The author in this communication describes the method which is adopted at the Butterley Works in the manufacture of the rails for the Midland Counties Railway. In general the ends, rough and ragged as they come from the rolls, are separately reheated and cut off by the circular saw, but the accuracy in this case depends on the workmen presenting the bar at right angles to the plane of the saw. As this cannot be insured, the difficulty may be obviated as follows. The axis of the saws and the bed of the machine, which is exactly like that of a slide lathe, are placed at right angles with the line of the rolls in which the rails are made; the saws are fixed in headstocks and slide upon the bed, so as to adjust them for cutting the rails to the exact length, and are 3 feet in diameter and $\frac{1}{8}^{\text{th}}$ of an inch thick, with teeth of the usual size, in circular saws for wood, and make 1000 revolutions per minute; the teeth are in contact with the hot iron too short a period to receive any damage, but to prevent all risk the lower edge of the saw dips in a cup of water. The saw plate is secured between two discs of cast-iron faced with copper and exposed only at the part necessary for cutting through the rail. The rail on leaving the rolls is hastily straightened with wooden mallets on a cast-iron plate, on which it lies right for sawing and sufficiently hot; thus a considerable saving of time, labour, and heat, is effected. The rail is brought into contact at the same time with the two saws, and both ends are cut off by one operation. If the saws be sharp and the iron hot, the 78 lb. rails are cut through in 12 seconds. The rail on leaving the saws is placed in a groove planed in a thick cast-iron plate; thus all warping is prevented. The author then describes certain mechanical arrangements, which are exhibited in detail in the drawing accompanying the communication.

"A description of the Turnbridges on the Herefordshire and Gloucestershire Canal."

By Stephen Ballard, A. Inst. C. E.

In taking to pieces the old turnbridges on the Herefordshire and Gloucestershire Canal, the author observed that the spikes used to fix the planks down to the carriers had caused the decay of the timber; that the balance weights of stone confined in a box under the planks kept the timber very moist; that the timbers near the ground where there was not a free circulation of air, and the wood wherever it was pierced with iron, were decayed,

In the bridges now described, no spikes are used to fix down the planks, but the planks are held in their places by two flat rods extending the whole length of the planking. The author then describes in detail, by reference to the drawing accompanying the communication, the peculiar method of construction which he has adopted. The planks are $\frac{5}{8}^{\text{ths}}$ of an inch apart, so that dirt and wet may not lodge in the joints. The bridge is balanced by two stones hung at the ends of the swing poles of about 6 cwt. each. The four principal carriers are supported by three cast-iron bearers fixed to a grooved circle, which rests on cast-iron balls, running in another grooved circle. By this construction no planks are pierced with spikes; the box of stones is got rid of, and a free access of air is obtained; and the peculiar causes of destruction to which turnbridges are exposed, are it is conceived in a great measure obviated.

"Description of an instrument for setting out the width of cuttings and embankments of Railways, Canals, or Roads, as particularly applicable to falling or side-lying ground." By Henry Carr, Grad. Inst. C. E.

The object of this instrument is to facilitate the operation of determining the distance of the outer lockspit from the centre line of a cutting or embankment, by avoiding all calculation, and reducing the usual threefold operation into one. The principle of its construction is the formation of a half cross section, which may be easily altered to suit all cases with regard to base, side slope, and inclination of surface. The construction of the instrument is described in great detail by reference to the drawing accompanying the communication. The author states that he set out a portion of the South Eastern Railway with this instrument, and found it answer exceedingly well. The experience of the first instrument has suggested some improvement in its construction, which is represented in another drawing.

"Observations on the present mode of executing Railways, with suggestions for a more economical, yet equally efficient system, of both executing and working them." By Francis Wishaw, M. Inst. C. E.

The author at the commencement of this paper alludes to the principal causes of the great differences between the original estimate and cost of railways. Among these he enumerates the imperfect knowledge of the strata, which occasions the cuttings and embankments to be formed with slopes, which are dangerous, and add to their cost—the imperfect formation of the embankments, especially in clayey soils, which in the opinion of the author ought to be carried up in layers or courses of from 1½ to 2 yards in thickness, sufficient time being allowed for subsidence before the next layer is added—the cost of stations, which in some of the great lines forms a considerable proportion of the whole cost.

The author then proceeds to suggest means for effecting a considerable saving in the original cost of railways, a certain method of preventing accidents by collision, a saving in the annual expenditure, and a better adaptation of the locomotive engine to its work.

With these views, he proposes a single line of rails—that the line should be divided with intermediate engine stations, three on the London and Birmingham for instance, the engines at each being suited to the prevailing gradient of the district. Thus a line of railway may be more easily laid out, as one or two unfavourable inclines will not affect the working of the whole. At each station there must be a small portion of an additional line of rails, and also at other convenient intervals. The mode of working such line is as follows:—Engines are to start simultaneously in each direction from the terminal and intermediate stations. These engines will pass each other at one of the portions of the double line, and the engine being reversed and taking the other train, will return to the station from whence it started, when another exchange of trains takes place. Thus there is a regular interchange of loads throughout the day, and each engine is confined to its own portion of the line, and it is impossible that a collision can take place. Equal accommodation would be afforded to the public, and the engine man, from being always confined to the same small portion of the line, would be perfectly conversant with every part of it. The saving which would on this system be effected on the original cost is estimated at more than £5000 per mile.

April 23, 1839.

The President in the Chair.

"On Steam Boilers and Steam Engines."

By Josiah Parkes, M. Inst. C. E.

In a preceding communication the author had treated of the amount of evaporation in different kinds of boilers in common use: in the present, he treats of their peculiar and relative merits as evaporative vessels; the laws which regulate the amount of evaporation for assigned heated surfaces; and the practical rules whereby the performance of boilers may be tested. The water evaporated and fuel consumed, had been tabulated in the previous communication; the author now gives the dimensions of the several boilers—the area of the grates—the area of heat-absorbing surfaces, and the rates of combustion and evaporation. The connexion of the boiler with the engine as regards the proportion of boiler to engine power, is reserved for consideration in a subsequent communication; the attention is now confined to the influence of the proportions of the parts on the performance of boilers for a given weight of coal. Evaporation may be considered as the measure of the useful effect obtained from any weight of fuel, or, together with the duty done by an engine, the measure of the useful effect of a given weight of water in the shape of steam. The author insists on the importance of ascertaining with accuracy the weight of the water, which in the shape of steam has passed through the cylinder of an engine. The weight of water, or quantity of steam, requisite for producing a given effect or duty, was the subject of continual research by Smeaton; and the basis of Watt's discoveries.

The author being led to make observations on evaporation twenty years ago, soon perceived that the completeness and rate of combustion, the proportion of the grates to the combustion effected upon them and to the whole heat-absorbing surface, were important elements in evaporative economy. These elements, in the author's own experiments at Warwick, where slow combustion was pushed to nearly its furthest limit—in those of Smeaton at Long Benton—of Rennie and Watt at the Albion Mills—of M. de Pambour on the Locomotive engine, in which intensity of combustion and evaporative power are at their highest limits—of Nicholas Wood on the Killingworth Engine—and of Mr. Henwood, and others, on the Cornish Boiler—are the data for the analysis of the evaporative effects; the true causes of which in the several experiments, the author now attempts to develope. The authentic facts here recorded of the working of boilers and engines of established credit and notoriety, will enable the employer of any boiler or engine to compare his practice with specimens of acknowledged and well-attested merit.

The results derived from the above data are arranged in a tabular form, so as to exhibit at once the relation which any one property and the several parts of the boiler bear to any other, and to the effects produced, the amount and activity of the combustion (to which the author assigns the term *calorific forces*), and the modifications it experiences by the structure and disposition of the several parts.

There are also certain quantities and relations which exert a peculiar influence over the results, which, being rightly ascertained, are exponential or indicative of the practice of each particular boiler: these Mr. Parkes calls the *exponents* of that boiler, and are as follow:—

The quantity of coal burnt under a boiler in a given time,—the quantity burnt on each square foot of grate per hour,—the quantity of water evaporated per square foot of heated surface—and the number of pounds of water evaporated by a given quantity of coal. Besides this, the influence of *time*, that is, the time of duration of any given portion of heat about a boiler, and about equal areas of surface, demands our most attentive consideration, and is specially treated of at the close of the paper. It appears most distinctly, that the boilers tested as to their merit by their respective evaporative economy, arrange themselves in the inverse order of the rate of combustion—the Cornish boiler being greatly superior to all the others when tested in this manner, as well also as in respect if time is selected as the standard of comparison, whereby to mark the scale of descent from the highest point of excellence yet attained in evaporative economy. For this purpose, then, the Cornish results are considered as unity.

The value of the exponents for the Cornish, Wagon and Locomotive Boiler respectively, are collected together in the following Table, which will serve to shew at one glance the respective values of the Boilers on this comparison.

Boiler.	lbs.	
Cornish	1·0.	of Coal burnt under one boiler in 44·08. seconds.
Wagon	1·0.	of ditto ditto in 16·57. ditto.
Locomotive..	1·0.	of Coke ditto in 6·45. ditto.
Cornish	3·4.	of Coal burnt on each square foot of grate per hour.
Wagon.	10·7.	ditto ditto
Locomotive..	79·3.	of Coke ditto
Cornish	1·0.	of Water evaporated by 1 square foot of heated surface per hour from 212°.
Wagon......	7·1.	ditto ditto
Locomotive ..	12·0.	ditto ditto
Cornish	11·8.	of Water evaporated by 1 lb. of coal from 212°.
Wagon......	8·8.	ditto ditto
Locomotive..	7·2.	ditto 1 lb. of Coke, ditto
Locomotive..	5·4.	ditto 1 lb. of Coal, ditto

The Cornish Boiler possesses some peculiar advantages, both as regards structure and the practice of slow combustion, since, by the former, great strength is attained, and, by the latter, time is given for the complete combination of air with the heated fuel, for the transmission of heat through the metal, and for the escape of the steam through the water. The plates of the Cornish boiler are usually ½ an inch thick, whereas those of a low pressure boiler are usually one-fourth to five-sixteenths of an inch thick; thus a much larger extent of surface is necessary to transmit a given quantity of heat in a given time in the former than in the latter case. The Cornish Engineers allow seven times as much surface as in the general wagon boiler practice, for the evaporation of equal weights of water in equal times, and twelve times as much as in the locomotive; from which there is a gain of from 30 to 40 per cent. in the former, and of 64 with coke and 100 with coal in the latter case.

The Wagon boiler has great disadvantages of structure, being ill adapted to resist internal pressure, liable to collapse, and greatly affected by incrustation. According to the above table, which exhibits the mean of eight experiments, the combustion is 2½ times more rapid per boiler, and 3 times more rapid per square foot of grate per hour, and the rate of evaporation is 7 times greater than in the Cornish. The loss of heat, the Cornish being unity, is 24½ per cent.

The construction of the locomotive boiler is so very different from that of every other species of evaporative vessel, that no strict analogy can be drawn betwixt it and any other. From the above practical results it appears, that the rate of combustion per boiler is nearly 7 times, and per square foot of grate per hour 23 times more rapid—that the rate of evaporation from equal surfaces 12 times more rapid than the Cornish boiler—the loss of heat, the Cornish being unity, 51 per cent.

The author discusses at length the varying circumstances connected with different boilers, and the corresponding influence on the above results, and particularly the system of management by which he was enabled with a Wagon boiler to approach the Cornish results. The table accompanying this paper will frequently enable the intelligent employer of a boiler to ascertain the best proportion of parts, and the best practice. For, having decided on the quantity of steam he requires, he knows the quantity of fuel which will generate it if he adopts the measures of surface and proportions of parts, which have given relative effects; or he can ascertain whether his present practice be good or defective. Notwithstanding the great stride which has been made in the economy of fuel by the Cornish Engineers, the sources of waste are still great, and we may hope for great advances in evaporative economy, when combustion as a science and practical art has received the attention which it merits.

[*To be continued.*

List of Patents

Granted for Scotland subsequent to 22d November, 1839.

To Alexander Borland, of Paisley, accountant, a machine for measuring water and other liquids, and regulating the quantity thereof.—Sealed 26th October.

James Smith, of Deanston Works, Perthshire, cotton-spinner, for certain improvements applicable to canal navigation.—Sealed 26th October.

George Chapman, of Whitby, engineer, for certain improvements in steam engines.—Sealed 26th October.

Samuel Wilks, of Darlston, Staffordshire, iron founder, for improvements in boxes and pins, or screws for vices and presses. —Sealed 28th October.

Thomas Nicholas Raper, of Blackfriars, London, for improvements in rendering fabrics and leather waterproof.—Sealed 28th October.

Robert Edward Morrice, of King William-street, London, (communicated by a foreigner residing abroad), for improvements in the manufacture of boots and shoes, and covering for the legs.—Sealed 28th October.

James Smith, of Deanston Works, Perthshire, cotton spinner, for a self-acting temple, applicable to looms for weaving fabrics, whether moved by hand or power.—Sealed 1st November.

James Yates, of Effingham Works, Rotherham, iron founder, for certain improvements in the construction of cupola or blast furnaces for melting metals, which improvements are also applicable to furnaces or fire-places for other purposes.—Sealed 1st November.

John Barnett Humphreys, of Southampton, civil engineer, for certain improvements in shipping generally, and in steam vessels, and in particular, some of these improvements, being individually novel, and some the result of novel applications or combinations of parts already known.—Sealed 1st November.

John George Bodmer, of Manchester, civil engineer, for certain improvements in machinery or apparatus for cutting, planing, turning, drilling, and rolling metals and other substances.—Sealed 8th Nevember.

William Newton, of the Office for Patents, Chancery-lane, London, civil engineer, for certain improvements in machinery or apparatus, for making or manufacturing screws.—Sealed 11th November.

James Sutcliffe, of Henry-street, Limerick, builder, for certain improvements in machinery or apparatus for raising and forcing water or other fluids, and increasing the power of water upon water wheels and other machinery.—Sealed 11th November.

James Ulric Vaucher, of Mount-street, Grosvenor-square, for certain improvements in fire engines and other hydraulic machines and apparatus, for raising or propelling water and other fluids, some of which improvements are also applicable to steam engines.—Sealed 11th November.

Moses Pool, of Lincoln's-inn, (communicated by a foreigner residing abroad), for improvements in apparatus applicable to steam boilers, in order to render them more safe.—Sealed 11th November.

James Craig, of Newbattle paper mills, county of Edinburgh, for an improvement or improvements in the machinery for the manufacturing of paper.—Sealed 12th November.

Pierre Auguste Ducote, of 70, Saint Martin's-lane, London, for certain improvements in printing china, porcelain, earthenware, and other like wares, and for printing on paper, calicoes, silks, woollens, oil cloths, leather, and other fabrics, and for an improved material to be used in printing.—Sealed 14th November.

John Dickenson, of Nash mill, county of Hertford, paper maker, for certain improvements in the manufacture of paper.—Sealed 18th November.

George Hanson, of Huddersfield, plumber, &c. for certain improvements in the construction of cocks or taps for drawing off liquids.—Sealed 19th November.

Frederick Clark, of Chelsea, for improvements on building ships, steam vessels, and boats, and also in the building of canal and river barges and lighters.—Sealed 22nd November.

Charles Andrew Caldwell, of Audley-square, London, (communicated by a foreigner residing abroad), for improvements in furnaces and apparatus for applying the heat of fuel.

William Wiseman, of George-yard, Lombard-street, London, (communicated by a foreigner residing abroad), for improvements on the manufacture of alum.

New Patents

SEALED IN ENGLAND.

1839.

To Stephen George Dordoy, of Blackman-street, Borough, chemist, for certain improvements in the manufacture of gelatine size and glue.—Sealed 31st October—6 months for inrolment.

To David Greenwood, of Liverpool, millwright, and William Pickering, of Liverpool, merchant, for improvements in engines for obtaining power.—Sealed 2nd November—6 months for inrolment.

To Samuel Morand, of Manchester, merchant, for improvements in machinery for stretching fabrics.—Sealed 2d November—6 months for inrolment.

To Theobald Wahl, of George-yard, Lombard-street, engineer, for improvements in boilers, applicable to locomotive and other engines. — Sealed 2nd November—6 months for inrolment.

To Alexander Angus Croll, of Greenwich, manufacturing chemist, for improvements in the manufacture of gas, and in reconverting the salts used in purifying gas, and improvements in the manufacture of ammoniacal salts.—Sealed 2d November—6 months for inrolment.

To John Cutten, of Margate, coal merchant, for improvements in garden pots.—Sealed 2nd November—6 months for inrolment.

To William Hannis Taylor, of New York, but now of Bridge-street, Blackfriars, Esq. for improvements in obtaining power by means of electro-magnetism.—Sealed 2nd November—6 months for inrolment.

To Frederick Augustus Glover, of Charlton, near Dover, clerk, for an improved instrument for the measurement of angles.—Sealed 2nd November—6 months for inrolment.

To Henry Venner Cocks, of Birmingham, iron founder, for certain improvements in stoves and furnaces.—Sealed 2nd November—6 months for inrolment.

To Henry Crosley, of Hooper-square, Leman-street, civil engineer, for an improvement battery or arrangement of apparatus for the manufacture of sugar.—Sealed 7th November—4 months for inrolment.

To James Murdoch, of Great Cambridge-street, Hackney-road, mechanical draftsman, for certain improvements in marine steam engines.—Sealed 7th November—6 months for inrolment.

To Thomas Yates, of Bolton-le-moors, manufacturer, for certain improvements in the construction of looms for weaving, and also the application of the same in order to produce certain descriptions of goods or fabrics by steam or other power.—Sealed 7th November—6 months for inrolment.

To George Hanson, of Huddersfield, plumber and glazier, for certain improvements in the construction of cocks or taps for drawing off fluids.—Sealed 7th November—6 months for inrolment.

To Thomas Whiteley and John Whiteley, of Stappleford, near Nottingham, lace makers, for improvements in warp machinery.—Sealed 7th November—6 months for inrolment.

To John Thomas Laurente Lamy Godard, of Christopher-street, Finsbury-square, merchant, for improvements in looms for weaving, to be worked by steam or other power, being a communication.—Sealed 7th November—6 months for inrolment.

To John Jones, of Westfield-place, Sheffield, for an improved table knife.—Sealed 7th November—6 months for inrolment.

To Edmund Moody, of Maiden Bradley, Wilts, yeoman, for improvements in machinery for preparing turnips, carrots, parsnips, potatoes, and all other bulbous roots, as food for animals.—Sealed 7th November—6 months for inrolment.

To Thomas Edmondson, of Manchester, clerk, for certain improvements in printing presses.— Sealed 9th November—6 months for inrolment.

To James White, of Lambeth, engineer, for improvements in machinery for moulding clay to the form of bricks and tiles, and also for mixing, compounding, and moulding other substances.—Sealed 12th November—6 months for inrolment.

To William Chesterman, of Burford, Oxford, engineer, for improvements in stoves.—Sealed 12th November—6 months for inrolment.

To Moses Poole, of Lincoln's-inn, gentleman, for improvements in making nails, bolts, and spikes, being a communication.—Sealed 12th November—6 months for inrolment.

To Moses Poole, of Lincoln's-inn, gentleman, for improvements in looms for weaving, being a communication. —Sealed 12th November—6 months for inrolment.

To William Wisemann, of George-yard, Lombard-street, merchant, for improvements in the manufacture of alum, being a communication.—Sealed 16th November.

To John Burn Smith, of Salford, Manchester, cotton spinner, for certain improvements in machinery for preparing roving spinning, and twisting cotton, and other fibrous substances.—Sealed 16th November—6 months for inrolment.

To Miles Berry, of the Office for Patents, Chancery-lane, patent agent, for an invention or discovery by which certain textile or fibrous plants are rendered applicable to making paper, and spinning into yarns, and weaving into cloth in place of flax, hemp, cotton, and other fibrous materials commonly used for such purposes, being a communication.—Sealed 19th November—6 months for inrolment.

To Francis Worrell Stevens, of Chigwell, Essex, schoolmaster, for certain improvements in apparatus for propelling boats and other vessels on water.—Sealed 19th November—6 months for enrolment.

To John Parsons, of the Stag Tavern, Fulham, victualler, for improvements in preventing and curing smoky chimneys.—Sealed 21st November—6 months for inrolment.

To Robert Hawthorn and William Hawthorn, of Newcastle-upon-Tyne, civil engineers, for certain improvements in locomotive and other steam engines, in respect of the boilers and the conveying of steam therefrom to the cylinders.—Sealed 21st November—6 months for inrolment.

To John Faram, of Middlewich, Chester, gentleman, for certain improvements in the mode of constructing, applying, and using railway switches for connecting different lines of railway, or two distinct railways, and for passing locomotive steam and other engines, and railway carriages and waggons from the one to the other of such railways, and for certain apparatus connected therewith.—Sealed 21st November—6 months for inrolment.

To Pierre Auguste Ducote, of Saint Martin's-lane, for certain improvements in printing china, porcelain, earthenware, and other like wares, and for printing on paper, calicoes, silks, woollen, oil-cloths, leather and other fabrics, and for an improved material to be used in printing.—Sealed 21st November—6 months for inrolment.

To William Daubney Holmes, of Lambeth-square, Surrey, civil engineer, for certain improvements in the construction of iron ships, boats, and other vessels, and also in means for preventing the same from foundering; also in the application of the same improvements, or parts thereof, to other vessels.—Sealed 23rd November—6 months for inrolment.

To John Hunt, of Greenwich, engineer, for an improved method of propelling and steering vessels—Sealed 23rd November—6 months for inrolment.

To Richard Hornsby, of Spittlegate, Lincoln, agricultural machine maker, for an improved machine for drilling land, and sowing grain and seeds of different descriptions, either with or without bone or other manure.—Sealed 25th November—6 months for inrolment.

To John Sutton, of John-street, Lambeth, machinist, for improvements in obtaining power.—Sealed 25th November—6 months for inrolment.

To James Craig, of Newbattle paper mill, Edinburgh, for an improvement or improvements in the machinery for manufacturing paper.—Sealed 25th November—6 months for inrolment.

To Arthur Collen, of Stoke-by-Nayland, Suffolk, plumber, for improvements in pumps.—Sealed 25th November—6 months for inrolment.

To James Matley, of Manchester, gentleman, for improvements in apparatus or instruments for the cutting of cotton or the wicks of lamps, being a communication.—Sealed 25th November—6 months for inrolment.

To George Rennie, of Holland-street, Blackfriars, civil engineer, for certain improved methods of propelling vessels.—Sealed 26th November—6 months for inrolment.

CELESTIAL PHENOMENA, FOR DECEMBER, 1839.

D.	H.	M.	
1			Clock after the sun, 10m. 50s.
	—		☽ rises 2h. 53m.
	—		☽ passes mer. 8h. 19m.
	—		☽ sets 1h. 32m.
	14	16	♀ in conj. with the ☽ diff of dec. 5. 57. N.
2	14	38	Ceres in conj. with the sun
	18	59	♃ in conj. with the ☽ diff. of dec. 5. 35. N.
3	6		☽ in Apogee
4	20		♀ in conj. with Vesta, diff. of dec. 3. 39. N.
		38	Her: □ ☉
5			Clock after the sun, 9m. 18s.
	—		☽ rises 7h. 43m. M.
	—		☽ passes mer. 11h. 16m. M.
	—		☽ sets 2h. 45m. A.
	2		♄ in conj. with the ☉
	15	39	♄ in conj. with the ☽ diff. of dec. 6. 28. N.
6	3	1	Ecliptic conj. or ● new moon
7	7	59	☿ in conj. with the ☽ diff. of dec. 3. 19. N.
1	15	12	♂ in conj. with the ☽ diff. of dec. 2. 40. N.
	21	48	☿ stationary
10			Clock after the sun, 7m. 7s.
	—		☽ rises 11h. 25m. M.
	—		☽ passes mer. 3h. 33m. A.
	—		☽ sets 7h. 51m. A.
12	1	47	☿ in the ascending node
	19	14	Her: in conj. with the ☽ diff. of dec. 1. 8. S.
13	9	48	☽ in □ or first quarter.
15			Clock after the sun, 4m. 46s.
	—		☽ rises 0h. 34m. A.
	—		☽ passes mer. 7h. 26m. A.
	—		☽ sets 1. 12. M.
16			♂ greatest Hel. Lat. S
	5	17	♀ greatest elong. 46. 50. W.
	15	16	☿ Perielion
17	6		♀ in Perlelion
18	11	41	☿ in Inf. conj. with the ☉
	17		☽ in Perigee.
19			Mercury R. A. 17h. 42m. dec. 21. 11. S.
	—		Venus R. A. 14h. 34m. dec. 12. 6. S.
	—		Mars R. A. 20h. 3m. dec. 21. 40. S.
	—		Vesta R. A. 14h. 5m. dec. 6. 21. S.
	—		Juno R. A. 1h. 21m. dee. 7. 10. S.
	—		Pallas R. A. 16h. 58m. dec. 3 25. N.
	—		Ceres R. A. 17h. 4m. dec. 21. 51. S.
	—		Jupiter R. A. 14h. 35m. dec. 14. 6. S.
	—		Saturn R. A. 16h. 53m. dec. 21. 8. S.
	—		Georg. R. A. 22h. 58m. dec. 7. 27. S.
	—		Mercury passes mer. 23h. 48m.
	—		Venus passes mer. 20h. 45m.
	—		Mars passes mer. 2h. 13m.
	—		Jupiter passes mer. 20h. 43m.
	—		Saturn passes mer. 23h. 0m.
	4	45	♀ in conj. with ♃ diff. of dec. 1. 58. N.
20			Clock after the sun, 2m. 19s.
	—		☽ rises 3h. 20m. A.
	—		☽ passes mer. Morn
	—		☽ sets 8h. 31m. M.
		45	Ecliptic oppo. or ○ full moon
21	23	22	☉ enters Capricornus, winter commences
24	20		☿ in conj. with Ceres, diff. of dec. 2. 14. N.
25			Clock before the sun, 0m. 11s.
	—		☽ rises 10h. 14m. A.
	—		☽ passes mer. 4h. 11m. M.
	—		☽ sets 11h. 6m. M.
26	17	26	♃'s first satt. will im.
26	23	41	☿ greatest hel. lat. N.
27			Vesta greatest hel. lat. N:
	1		☿ in conj. with Pallas, diff of dec. 23. 21. S.
	4	45	☽ in □ or last quarter
30			Clock before the sun, 2m. 39s.
	—		☽ rises 3h. 4m. M.
	—		☽ passes mer. 7h. 39m. M.
	—		☽ sets 0h. 4m. A.
	12	5	♃ in conj. with the ☽ diff of dec. 6. 0. N.
	20	0	☽ in Apogee.
	22	6	☉ in Perigee.
31	9	47	♀ in conj. with the ☽ diff. of dec. 8. 11. N

J. LEWTHWAITE, Rotherhithe.

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Recent Patents.

To Lemuel Wellman Wright, *late of Manchester, in the county Palatine of Lancaster, but now of Elland, near Halifax, in the county of York, civil engineer, for his invention of certain improvements in machinery or apparatus for bleaching or cleansing linens, cottons, or other fabrics, goods, or other fibrous substances.*—[Sealed April 20th, 1837.]

These improvements in machinery or apparatus for bleaching or cleansing linens, cottons, or other fibrous substances, are improvements upon the invention, for which a patent was granted by His late Majesty King George the Fourth, to me, the said Lemuel Wellman Wright, my executors, administrators, and assigns, dated at Westminster, the twentieth day of April, in the sixth year of his reign, and in the year of our Lord, one thousand eight hundred and twenty-five.

Now these my present improvements consist, firstly, in the peculiar construction of a steam or air-tight vessel, in which the goods or fibrous materials intended to be bleached are packed in close contact; secondly, in the manner of passing the alkaline solutions through the compact mass of goods or fibrous materials, by the agency of steam at a high pressure, which has the effect of opening the fibres of the material under operation; thirdly, in the mode of rinsing or washing out the alkali, or other chemical matters used in the process of bleaching by means of high pressure steam; fourthly, in the manner of forcing the solution of chloride of lime and sulphuric acid through the goods in the bleaching vessel by hydraulic and pneumatic pressure; and fifthly, in the mode of cleansing or rinsing the chemical matters from the goods after the bleaching operation has been completed.

Plate XII., fig. 1, represents the complete apparatus as seen in front elevation, with the pipes employed for conducting the fluids into and out of the several vessels. The entire length of the pipes is not represented in order to bring the important parts of the apparatus conveniently into one drawing, but the length of the pipe omitted is about twenty feet; fig. 2, is a side or end elevation of the same, in which the positions and forms of some of the pipes are more evidently seen than in the former figure; fig. 3, is a plan or horizontal representation of the same apparatus as it would appear if seen from above; and fig. 4, is a sectional elevation of the complete apparatus taken through the vessel in which the packed goods are to undergo the bleaching and cleansing process, through the vessel intended to contain the alkaline solution, and through some of the pipes or tubes communicating with the several vessels. The same letters of reference point out the same parts of the apparatus in the several figures.

The kier or bleaching vessel *a, a, a,* is of a rectangular form made of cast iron, and tapering downwards at the sides and ends near the bottom, as represented in the drawing. This vessel I propose to line with slabs of slate, or any stone, or other material, that will not be subject to be acted upon by the chemical matters which have to pass through the vessel, but I think slate the best. A lid or cover of the same materials is made to fit, being air and steam tight, and is held down by swivel bolts and screw caps or nuts. A false or double bottom *b,* of slate or other such material, with ribs on its under side, fits into the lower part of the vessel and is perforated with small holes, for the purpose of allowing the liquors to flow through into the pipe *c,* below.

The goods (say raw flax or linen) being packed in the vessel *a,* as at *d, d,* to the height of the levelled or tapering part and resting upon the false bottom, are to be pressed down by a grating *e, e,* made of large slabs of slate or other suitable material, which grating may be weighted by blocks of stone if necessary. A vessel *f,* contains the alkaline ley, which should be of about the strength of thirty pounds of soda ash to six hundred gallons of water, according to the nature of the goods under operation, which must in some measure be determined by the judgment of the operator. The alkaline ley is admitted into the kier *a,* through the pipe *g,* and when the kier *a,* is nearly full, (that is up to the height of the pipe *g,*) the stop-cock *h,* is then to be closed.

Steam at a high pressure (say from thirty to one hundred pounds upon the square inch, according to the nature of the materials to be acted upon) is now to be admitted into the kier *a,* by a pipe *i,* leading from a steam boiler, situate in any convenient place nearly contiguous. The steam thus introduced being allowed to continue acting upon the alkaline liquor in the close vessel *a,* for a considerable time, it will cause the liquor to boil, and the ebullition thus produced under the great pressure of the steam, will force the alkaline liquor through the substance of the compact goods, and in so doing open or separate the fibres of the material, and soften the gummy and colouring matters.

When the liquor has completely penetrated through the entire mass of the material intended to be bleached, the stop-cock *j*, in the pipe *c*, is to be opened, which will allow the whole of the liquor in the vessel or kier *a*, by the force of the steam, to be driven through the goods or materials under operation, and to rise and return back again through the pipe *e*, *e*, *e*, into the vessel *f*.

This operation must be repeated according to the nature of the articles operated upon, that is to say, the alkaline liquor from the vessel *f*, must be passed through the pipe *g*, into the kier *a*, and then by letting on the steam as before, the alkaline liquor must as above be forced through the material again and again until the gummy or colouring matter is sufficiently removed.

The alkaline liquor must now be discharged from the vessel *a*, which is done by closing the cock *j*, and opening the cock in the descending pipe *k*, when by the pressure of the steam, the liquor will be forced through the goods and through the pipe *k*, into a stone cistern below.

In order to remove the remaining alkali from the goods, the vessel *f*, must be filled with clean water, and this water be passed through the goods several times in the same way, and by the same means as the operations of the alkaline solution were performed, occasionally withdrawing the foul water, and supplying clean water as may be required for rinsing the alkali out of the goods.

The goods in the vessel *a*, should now be cooled down to about 100° Fahrenheit, by passing cold water through them merely by hydraulic pressure, unassisted by the force of steam, which is done by the altitude of the water flowing from the vessel *f*, (about thirty feet) or by the pressure of air forced into the vessel *a*, by an air pump, the stop-cocks in the several connecting pipes being closed.

Having thus reduced the temperature of the goods or fibrous materials, a solution of chloride of lime or bleaching powder, with the ordinary proportions of water, is now to be passed through them from the stone cistern *l*, by the pipe *m*, and cock *n*, and this pipe *m*, communicating with the induction pipe *g*, of the vessel *a*, liquor is made to percolate through the goods by hydraulic or pneumatic pressure, and flow away by the eduction pipe *c*, and through the cock *o*, and branch pipe *p*, into a cistern *q*, below. From this cistern the chloride liquor is to be raised by a pump *r*, through the pipe *s*, again into the vessel *l*, and the operation upon the materials may be repeated according to the judgment of the operator, depending on the strength of the alkali and the nature of the goods under process;—generally from four to five hours would suffice for manufactured goods, and from two to three for the raw material of hemp or flax, with a solution of the ordinary strength,—and having passed the bleaching liquor through the goods as many times as may be required, it is left in the cistern *q*, below.

In order to wash the chloride from the goods or fibrous materials, clean water from the vessel *f*, must be forced through by steam pressure, as before described, taking care to close all the cocks, except those which pass the water from the vessel *f*, through the kier.

The operation called souring is performed by conducting a weak solution of sulphuric acid and water (such as is commonly used by bleachers) through the goods or fibrous materials in the kier *a*, from the vessel *t*, by the pipes *n*, in the same manner as the chloride liquor was conducted; and after this sour liquor has passed through the goods in the kier, it is discharged by the pipe *v*, into the cistern *w*, and the operation repeated if required.

In order to remove all the acid from the fibres of the goods, rinsing water must be forced by high pressure steam through the kier *a*, in the manner before described, and when the rinsing has been completed, high pressure steam alone is allowed to pass through the goods or fibrous materials, which will remove the moisture and leave the goods nearly dry. Or the "chloride" and "souring" operations or processes, may be performed in another kier or vessel of the same size and shape, which may be made of stone, the goods being removed from the kier *a*, for this purpose, and then returned for the rinsing, and alkali, and other operations; and in this case the kier *a*, need not be lined with stone;—this will also facilitate the operations or working.

Now whereas it is obvious that this my invention of improvements may be carried into effect with great variety, in the detail of parts according to circumstances, I do not claim any of the separate parts of the machinery or apparatus above-mentioned, or their mode of working when separate, but I do claim as my invention of certain improvements, the combination thereof, for the purposes hereinbefore set forth as above described and explained.—[*Inrolled in the Rolls Chapel Office, October*, 1837.]

Specification drawn by Messrs. Newton and Berry.

To Richard Prosser, *of Birmingham, in the county of Warwick, civil engineer, for his invention of certain improvements in apparatus for generating steam, consuming smoke, and heating apartments.*—[Sealed 19th February, 1839.]

These improvements in apparatus for generating steam consist in the employment of vertical tubes attached to the bottom of ordinary boilers. Fig. 1, Plate XIII., shews a plan view of a pair of marine engine boilers, one of such boilers having my tubes attached, the other boiler being of the ordinary construction for steam vessels.

Fig. 2, represents three tubes attached to the bottom of a boiler; these tubes it will be seen rise above the bottom of the boiler, two of the tubes being shewn in elevation, and one tube in sectional elevation. The height of the water or water-line of the boiler is shewn by a dotted line in fig. 2.

It will be seen by examining the sectional elevation, fig. 3, that the tube which has its external surface exposed to the heat of the fire, contains within it another tube of about half the area; these tubes are both circular in their cross sections, but the internal tube is curved at its upper end, and both its upper and lower ends are open; the external tube has one opening on its side for the curved end of the internal tube to pass through, this curved tube then becomes the channel for the water to pass from the bottom of the boiler, in the direction indicated by the arrow, to the bottom of the external tube; the water then ascends in the annular space formed between the two tubes, and water and steam issue from the top of the tube; any impurities mechanically suspended in the water rise through the tube, and falling over the side into the reservoir, situated above the bottom of the boiler, remain there until they are removed by the operation of blowing out. Particles of matter are thus prevented from accumulating on the bottom of the boiler, and incrustation of the boiler is prevented: the current of water and steam up the external pipe, is sufficiently powerful to eject any impurities mechanically suspended in the water.

Many persons have proposed to attach tubes to boilers, and Count Rumford constructed a boiler on this principle, as may be seen in Tredgold's work on the steam engine, first edition, page 135. Perkins also proposed the use of tubes, and his method is shewn at fig. 3.

The tube is shewn attached to the bottom of the boiler, and has its lower end closed, the upper orifice being open; another is placed within it, and the internal tube is open at both ends. The fire operates upon the external surface of the external tube, and gives motion to the water, as indicated by the direction of the arrows, but when such tube is exposed to an intense fire, the water and steam issue with such force from the orifice of the tube at A, as to prevent the water getting access to the internal tube; the water being driven out or converted into steam, the tube by the action of the fire becomes heated red hot, and of course destroyed.

I secure my tubes from destruction by insuring a supply of water to their interiors in the manner shewn by fig. 2, where the water is shewn entering the internal tube at the letter A, a hole being formed in the side of the external tube to receive the end of the internal tube, the water passes down the internal tube and out at its lower end which is open for the purpose; the water then returns up the concentric space between the external and internal tubes, and the water becomes partially converted into steam, the water and steam issuing from the mouth of the external tube at B.

I lay no claim to the application of tubes, merely in the construction of boilers for generating steam, but I claim the peculiar method of constructing such tubes as shewn in sectional elevation at fig. 3, the object attained being the preservation of the tube so long as the orifice A, of the internal tube is under water, for however rapidly water and steam may issue from the tube at B, a corresponding velocity is communicated to the water in a downward direction through the internal tube, the water supplying the internal tube entering by the orifice A, situated as near the bottom of the boiler as may be found convenient.

My improvements for consuming smoke are shewn at figures 4, 5, 6, 7, & 8; 4 being a plan of a boiler for generating steam, 5 a sectional plan, 6 a front elevation, 7 a longitudinal section, and 8 a back elevation; A, A, A, shewing the flues or openings through which the products of combustion pass on their way to the chimney. It will be perceived that instead of the ordinary bridge shewn by dotted lines, fig. 7, I place the bridge at a distance from the end of the fire-bars and close against the bottom of the boiler; the gases formed by the combustion of the fuel are prevented passing along the bottom of the boiler by the bridge B,—they of course descend under the bridge as shewn by the arrows and through the flues or openings A, on their way to the chimney; the space between the end of the fire-bars and the bridge B, is formed of fire bricks, forming an inclined plane, upon which the red hot coal is pushed either purposely or accidently by the process of stoking; the bricks become heated, and cause the combination of these combustible gases, which pass over and become heated by the hot bricks; and this arrangement for consuming smoke is what I claim as my invention.

My invention, so far as relates to improvements in apparatus for heating apartments, consists in a peculiarly constructed stove, which I denominate for the sake of distinction, the Chunk Patent Stove. My said stove is formed of three essential parts, namely, a base or stand, a portable furnace or fire-pot, and an envelope or case.

The base of my stove is a circular plate of cast iron standing on three feet, with three concentric rings on its upper surface, having an aperture in its centre and a valve adjusted to such aperture to regulate the admission of the external or atmospheric air, and a tube or flue for the escape of the gases of combustion in the manner hereinafter described. The portable furnace consists of a conical bucket of sheet iron (with or without a lid or cover) having an iron grate inside supported at about one-sixth part of its depth, by three studs or brackets projecting about half an inch on the inside, which prevent the grate from being displaced by the weight of the fuel, and form underneath an ash pit or receptacle for the ashes or dust caused by the combustion of the fuel employed. In the centre of the ash pit is placed a funnel or chimney covered at the top to prevent the ashes falling through, and perforated on all its sides to admit the external air in contact with the fuel. From the centre of the lid a short tube projects, (being a continuation of the funnel or chimney) covered with a valve which closes by its own weight, and a lever which opens the valve by pressure against the envelope when the stove is in use. The envelope or cover is a cylinder of sheet iron closely covered at the top, and adjusted at the bottom to the space between the two other rings on the upper surface of the base of the stove. The figures respectively marked *z*, *x*, *y*, *w*, *v*, *u*, T, S, and R, refer to the several parts of my stove hereinbefore and hereinafter described.

When it is desired to use my said stove, it is requisite that the tube or flue for the escape of the gases of combustion, should be let into a chimney common air flue, or connected with the atmosphere in any other suitable manner to cause a draught of air through my stove; a sufficient quantity of sand is then strewed between the rings on the upper surface of the base of the stove to prevent the escape of smoke or vapour. Fuel is then put into the furnace, and the furnace placed over the aperture in the base, and the envelope is then to be placed over the furnace.

It will be obvious from this statement, that when my said stove is so in use, the external air for maintaining combustion is admitted through the aperture A, in the base of the stove and up the funnel at the bottom of the furnace into the ash pit, formed between the grate which supports the fuel and the bottom of the fire bucket, and thence through the fuel, and by which the gases evolved during the combustion are carried upwards through the funnel in the lid of the fire bucket, and thence downwards between the outside of the furnace and the inside of the envelope into the flue D, communicating with the external air; or in case of there being no flue, the gases may be exhausted by mechanical means and delivered into the atmosphere at any suitable place.

My said stove is shewn as in use by the sectional elevation at figure s, and it will be perceived that the valve in the lid of the furnace is kept open (as it must be, to allow combustion going on) by the lever pressing against the inside of the envelope. The ring in the centre of the base of the stove is for the purpose of preventing the sand falling through the aperture A; the next ring B, is to receive the fire bucket, and the outer ring C, to receive the rim of the envelope. The bottom rim of the fire bucket and the bottom rim of the envelope are placed in the sand upon the base of the stone, by which the passage of air or smoke in that direction is prevented. A portion of fuel should be ignited previously to the furnace being placed on the base of the stove, after which the furnace may be filled with fuel in a cold state, though the fuel may be lighted when the furnace is in its proper situation, by having a tube to convey the smoke and vapour into a suitable tunnel during ignition. The fuel I prefer is coke.

When my said stove requires replenishing, the envelope must be removed, when the valve at top of the furnace will fall by its own weight, and the dust and vapour is prevented from escaping from the bucket. The furnace is removed by its swinging handle to a suitable place for emptying out the ashes, which may be done by inverting the furnace, when the grate, which is loose, will fall out with the ashes. The grate must be replaced and the furnace will then be ready for a fresh supply of fuel, and to be returned to its place. The fire will burn slowly, and it may be extinguished by closing with its valve the aperture A, shewn in the sectional representation of the stove, fig. S.

By my method of constructing stoves, shewn in the figures *z*, *x*, *y*, W, U, T, S, R, I obtain great economy of fuel, great cleanliness, and, owing to my stove having no doors, either for the admission of fuel or for the removal of ashes, I admit only so much atmospheric air into the furnace as is requisite to support combustion; and I prevent the egress of noxious vapours or gases into the apartment where they are used. A fusible compound of metal may be used in lieu of sand, within the rings of the base of my stove, to prevent the escape of the gases of combustion, but I have found fine sand to answer the purpose, and it is more economical, and what I use.

In my said stoves I have obviated the great objection against close stoves, of their becoming too hot in consequence of their contact with the burning fuel. In the construction of my said stove no part of the envelope is in contact with the fuel, but is situate at such a distance from the furnace as to prevent its being overheated, and cannot therefore, contaminate the air of any apartment. When for the purpose of ornament, or durability, the envelope is made of cast iron, or other heavy material, its removal, in order to replenish the fire bucket, would on account of its weight be objectionable in such a case. I obviate the necessity of removing the envelope, by making the top only of such envelope moveable, and making the same air tight by grinding the top into the cylinder which forms the envelope, or by sand or fusible metal, as before described. On removing the top of the envelope the furnace can be withdrawn and replaced, for the purpose of removing ashes and recharging the apparatus with fuel. When the envelope is made of very light material to facilitate its removal, it will require in some cases to be connected to the base of the stove by catches, to prevent the accidental removal of the envelope, and the consequent escape of vapour. One of such catches is shewn at figure v, letter c.

It will be observed by inspecting the drawings descriptive of my invention, so far as relates to improvements in apparatus for heating apartments, that I have no doors, as in ordinary stoves, and this is one valuable peculiarity of my stove, which I claim; the other peculiarity which I claim, is the portable furnace, or moveable and detached fire bucket, as applied in the construction of my said stove. I lay no claim to the use of sand or other substance for the purpose of making smoke tight joints, because the modes of effecting that are well known; neither do I claim, as any part of my invention, the admission of air to fuel in combustion through a small aperture regulated by a valve, such methods being well known and commonly practised.

I have not described how a regulator may be attached to the valve of my stove, because the modes are well known, and I think it much simpler to operate upon the valve by the human hand; such regulator may of course be applied, and I leave the choice of the mode to those who shall require it.

I have in this my specification described the improvements which I claim as mine, and shewn my methods of carrying the same into effect; and by a perusal of my specifications and an inspection of the drawings annexed thereto, it will be perceived that the advantages which I claim for my improvements in apparatus for heating apartments, arise from the peculiarity of construction and the arrangement of the parts before mentioned, which I have invented and found out, and claim as mine.—[*Inrolled in the Rolls Chapel Office, August,* 1839.]

To HENRY ROBINSON PALMER, *of Great George Street, Westminster, civil engineer, for his invention of improvements in giving motion to barges and other vessels on canals.*—[Sealed 20th October, 1837.]

THE object of this invention is to reduce the ordinary cost of conveying goods, minerals, and other weighty materials, which do not require an expeditious transit.

The patentee states in his specification, that when the traffic upon a canal exceeds a certain amount, the locomotion of the barges may be more economically produced by giving motion to the water, and thus creating a current, than by drawing the said barges through the water, while in a quiescent state, as hitherto.

Causing an artificial current in canals, by means of which barges or other vessels may be transported from one situation to another, is therefore the subject of this patent. The manner of effecting this object is described by the inventor to be forming two separate channels, parallel to each other, and united at the ends, so that when both are supplied with water, and motion is given to the water in one of the channels, that motion is communicated to the water in the other channel, and thereby a continual current or circulation of the water will be produced, which will be found capable of carrying barges or other vessels in either direction, according to the channel in which the vessels may be placed.

Fig. 1, Plate XIV., represents a plan view of a portion of a canal constructed according to this invention; fig. 2, is a transverse section of the same; and fig. 3, represents a longitudinal section of that part of the canal opposite the engine-house; *a, a,* is one channel, and *b, b,* the other channel; *c,* is the lock closed by gates *d, d,* in any convenient manner. The water is put in motion by a lift-wheel *e,* seen best in fig. 3; in the same figure *f,* is a dam over which the water from the channel *a,* is lifted by the wheel *e.*

It will now be understood that as the wheel revolves and lifts the water from the channel *a,* the water in the other channel will flow in the opposite direction, as indicated by the arrow, in order to supply the deficiency, so that by these means, a continual current is created which will move any body, such as a barge, which may be placed therein.—[*Inrolled in Inrolment Office, April,* 1838.]

To Henry Jones *and* Thomas Jones, *both of Marple, in the county of Chester, weavers, for their invention of a certain method of expanding or stretching cloth, and keeping it even during the process of weaving, and of preserving the selvages thereof.*—[Sealed 4th May, 1833.]

This apparatus would be called by weavers *self-acting temples.* It is designed, like ordinary temples, to keep the cloth in tension, and at a uniform width during the operation of weaving.

Various modes of effecting this object will be found in the pages of our journal, and some we think much more simple in their construction and operation than the present.

The patentees apply at each side of the loom two pairs of nippers of peculiar construction: they are attached to sliding pieces worked from some of the ordinary moving posts of the loom, for the purpose of opening the nippers and letting go the list of the cloth, and for taking hold again of the list and stretching the cloth out to its proper breadth.

Each pair of nippers consists of a horizontal sliding piece or chap, having projecting points which protrude into the list of the cloth, and a lever chap, which, being brought against the former,holds the cloth securely between them.

The lever chap is held up to its bearing by a spiral spring, but is lifted away from its hold by a strap or jointed lever attached to the slider; so that as the slider recedes, the lever chap rises, and the cloth is released from their hold.

We have said that there are two of these pairs of nippers at each side of the loom, the object of which is, that when one pair of the nippers are made to let go their hold, the other pair of nippers may hold the list of the cloth fast.

These two pairs of nippers on each side of the loom, are placed nearly close together; they have besides their sliding movement in and out, or to and from the lists, a slight horizontal action in a segmental direction upon a pivot; so that either of them having withdrawn from holding the list, it may take hold of the list again a little in advance of its former place. This segmental movement of the nippers is effected in its advancing direction by a lateral spring, and is brought back again by the progress of the cloth as it is drawn over the breast beam.

The sliding chap (having the points or tenters that take into the lists) acts in a long narrow box, and by a spring is drawn back from its holding position, but pressed up into its holding position by a rotary cam behind it. This rotary cam is a cylinder, having a recess in its periphery, so that when the cane is acting against the sliding part, the chap is pushed forward, and its points protrude into the list, the lever chap by the same movement being brought down and the nippers thereby made to take fast hold; but when the recess in the rotary cam comes round, the spring causes the slide to retreat into the recess in the cam, and the chaps of the nippers thereby open and relinquish their hold.

The nippers on the opposite sides of the loom, of course act in opposite directions to distend the cloth, and through the mechanism by which they are actuated, the two opposite corresponding nippers are made to hold fast the cloth, whilst the other two are withdrawn from their hold. These reciprocating movements take place as often as the accumulation of the cloth by the weaving renders it necessary, and when the nippers slide back, they are, by the lateral springs, moved side-ways towards the batten in order to take hold again of the lists in fresh places.—[*Inrolled in the Inrolment Office, July*, 1833.

To Samuel Stocker, *of the city of Bristol, machinist, for his invention of improvements in chimneys for dwelling houses, and in apparatus for scraping, sweeping, or cleaning chimneys, and in the manufacture of such apparatus, and in the materials of which such chimneys are formed.*—[Sealed 21st August, 1838.]

This invention is divided into two parts,—and consists, firstly, in a novel mode of constructing the chimneys of dwelling-houses; and secondly, in an improved apparatus for clearing or sweeping chimneys.

By the improved method herein specified, it is found, that a chimney may be constructed in such a manner, that it will occupy less space, and may be cleaned or swept with much greater facility than the ordinary brick chimneys.

Fig. 1, Plate XV., shews the method of constructing chimneys as proposed by the patentee; and consists of a number of earthenware tubes, (similar to the chimney pots now in use), placed one on the top of the other, and surrounded by a light brick-work; the interstices between the brick-work and the tubes, being filled up with mortar or cement, as the chimney is being built. It will be seen that the lower parts of the tubes overlap the top of those tubes which are immediately beneath. The patentee observes, that it is evident, that square or other shaped tubes may be used; but, he considers that round ones, or those shewn in the figure, are preferable.

The second part of the invention relates to improvements in apparatus for scraping, cleaning, or sweeping chimneys.

Fig. 2, represents a section of an ordinary brick chimney, having the apparatus applied thereto. This apparatus consists of several elastic brushes attached together, thus forming one brush; and to the upper end of this brush, a chain or rope is attached. This chain or rope is passed over a pulley placed above, and is used for raising or lowering the brush. When the apparatus is required for use, the brush is attached to the chain as before stated, and is drawn up and down the chimney; and as it comes into contact with the sides of the chimney, it will very speedily dislodge all the soot.

Fig. 3, represents a side and plan view of another description of brush to be used in sweeping straight chimneys, and consists of a circular brush mounted on a spindle, to the end of which the chain is attached. When the chimney is cleaned, the brush may be detached, and the chain placed out of the way, on the side of the fire-place.

There is, also, another method of cleaning chimneys described in the specification, which is, by attaching lateral chains to the one which passes from the top to the bottom of the chimney. The long chain is swung round, from below, and the small lateral chains, coming in contact with the sides of the chimney, will remove the soot.

The patentee says, that although he has shewn and described a brush, as the instrument to be used for cleaning the chimneys, yet it is evident, that other articles, such as a scraper of iron, may be employed.

In conclusion, it is stated that the nature of the improvements and the manner of carrying the same into effect, having been described, the invention secured under the present letters patent consists, firstly, in a method of constructing chimneys as above described; and secondly, in the mode of arranging apparatus, having a roller or suitable supports at the top for a chain or cord to work on, for sweeping, cleaning, or scraping chimneys, as above described.—[*Inrolled in the Inrolment Office, February,* 1839.]

To John Ericsson, *of Albany Street, Regent's Park, in the county of Middlesex, civil engineer, for his invention of an engine for producing motive power, whereby a greater quantity of power is obtained, by a given quantity of fuel, than heretofore.*—[Sealed 4th April, 1833.]

This is a peculiar arrangement of the ordinary parts of a high pressure steam engine, connected to certain heating apparatus, but in this instance the engine is intended to be worked by heated air or gas.

Two working cylinders, having ordinary pistons, &c., are placed with a third cylinder between them; the latter may be called an air pump, and a crank shaft is connected above to the piston, and to each of the two working cylinders an enclosed furnace is connected, having within it a system of pipes for the passage of the air or gas which is raised in its temperature as it proceeds through the furnace to the induction aperture of each working cylinder. When the heated air has performed its office by raising the piston in the working cylinder, it passes off by the eduction aperture into the middle cylinder or air pump, and is thence forced through a pipe into a large vessel called a regenerator.

This regenerator is of a cylindrical shape, and contains two unconnected systems of horizontal pipes, which are in close contact with each other; the one system of pipes communicates with one of the working cylinders and its furnace,—the other system of pipes with the other working cylinder and its furnace, and performing an endless circuit through them.

Before setting the engines to work, the regenerator is to be heated in any convenient manner, and that heat will be kept up by the smoke and vapours from the furnaces, as the flues from them pass round the jacket that envelopes the regenerator. The whole of the tubes connected with both of the working cylinders, are to be filled with air, and that air is to be raised to the required temperature by passing through the pipes in the furnaces.

When the engine is to be set to work, the induction valve of one of the working cylinders is opened, and the heated air from the pipes in the furnace then rushing in under the piston, by its elastic force raises the piston in the same way as in ordinary steam engines. When the piston of the first working cylinder has been made to perform its stroke, the induction valve of the second working cylinder is to be opened, and the heated air admitted from its furnace, in order to raise the other piston in like manner. At the same time the eduction valve of the former cylinder is opened, and the heated air is allowed to escape into the middle cylinder or air pump, by which it is forced through a tube into the regenerator.

The system of pipes in the regenerator, connected with the first mentioned working cylinder, will thus be rendered much hotter than the ordinary or uniform temperature of the regenerator; and the air in the other system of pipes, connected with the second working cylinder, being of a lower temperature and in contact with the heated pipes will, as it passes in an opposite direction, proceeding towards its furnace, abstract the heat from the furnace, and at its increased temperature enter the pipes of its furnace.

The eduction valve of the second working cylinder will now open, and the air which raised its piston pass into the air pump and be forced in its turn into the regenerator; the induction valve of the first cylinder at the same time opening again and allowing a volume of heated air from its furnace, as before, to raise the piston, whilst the eduction air from the second cylinder will in the regenerator part with its caloric to the pipes of the first series.

In this way it is intended that the two separate volumes of air belonging to the two working cylinders, and circulating in their respective systems of pipes in the regenerator, shall reciprocally as they approach their furnace take up the heat from the eduction, and by that means require very little heat in their furnaces before they act upon their pistons; and the patentee presumes that scarcely any of the heat will be lost except by radiation, and that therefore a very small consumption of fuel will be found sufficient to keep the working cylinders in constant operation.

The machinery is so arranged that its working parts shall open and close the valves as in ordinary steam engines, and the crank shaft being connected to the pistons of all three cylinders, the air pump will be worked simultaneously with the other operations; and if any portions of the volumes of air escape through leakage, that may be replaced by air cocks connected to the tubes.—[*Inrolled in the Inrolment Office, October* 1833.]

To Claude Marie Hilaire Molinard, *of Bury Street, St. Mary Axe, in the City of London, merchant, for an invention of certain improvements in looms or machines for weaving fabrics; being a communication from a foreigner.*—[Sealed 9th April, 1833.]

This is described as an improvement upon the Jacquard or Lyons loom, and though the specification is extended to an enormous length, the matter of invention may be told in a very few words, viz:—it is changing the situation of the roller which carries the pattern cards from the upper part of the loom, as heretofore, to a place beneath the work threads.

The specification recites that a patent was granted in England for the Jacquard loom, to Francis Lambert, in the year 1820, (see Vol. II. of first series of our journal, p. 95), and for further improvements on the same to Stephen Wilson, in 1821, (see the same volume of our journal, p. 255.) It then goes on to describe these former inventions, in which an endless succession or chain of cardboards placed above the loom and pierced with certain holes, were successively brought to act against the ends of certain horizontal rods, for the purpose of removing certain hooks connected with the warp threads, and thereby preventing those portions of the warp threads being raised when the ordinary movements of the loom lifted the harness to open the studs.

As we have referred to the original inventions, it will be be unnecessary to describe the parts and operation of the loom more fully, especially as the Jacquard loom is now perfectly well known to all weavers.

The present invention is to place the roller which carries the pierced cards under the warp threads in the back part of the loom, and to cause the pierced cards as they successively come into operation, to act against the under parts of a series of perpendicular needles, through the eyes of which the warp threads are severally passed. By these means the selected portions of the work which are to produce the embroidered figure or pattern upon the fabric, are raised or depressed by the pierced cards in a more sinple manner than by the original marking placed above.—[*Inrolled in the Inrolment Office, October* 1833.]

To HENRY KNILL, *of Eldon Place, Grange Road, Bermondsey, in the county of Surrey, for his invention of improvements in cleansing the bottoms of docks, rivers, and other waters.*—[Sealed 30th August, 1838.]

THIS invention is for a method of cleansing the bottoms of rivers, docks, harbours, and other waters, and consists in attaching a rake or other similar instrument to the stern of a steam vessel, by means of a chain, in such a manner, that the said rake may drag, draw, or rake the mud into a tide-way or stream, in order that it may, by this means, be carried away.

At the conclusion of the specification, the patentee says, that he does not claim "the apparatus separately nor the steam boat shewn and mentioned, when separately, considered;" but he claims, as his invention, "the mode of cleansing the bottoms of docks, rivers, and other waters, by means of a steam boat, having suitable apparatus combined therewith, as above described."—[*Inrolled in the Inrolment Office, February,* 1839.]

To JOHN SMALL, *of Old Jewry, in the city of London, merchant, for improvements in the manufacture of thread or yarn, and paper, by the application of certain fibrous materials not hitherto so employed.*—[Sealed 1st December, 1838.]

IF our readers will take the trouble of turning to Vol. XIII. page 231, of the present series of our journal, they will find Mr. Small's invention described with the greatest minuteness, under the title of a patent granted to Mr.

Miles Berry, for a French discovery, communicated to him by a foreigner residing abroad, and dated May 14th, 1838.

The present patentee proposes to manufacture paper, thread, or yarn, from the fibres of the Banana tree, the fig tree, the palm tree, the aloe, and the plantain. All these plants are severally mentioned, and the process of manufacture described and explained in the specification of Mr. Berry's patent, which was inrolled in the early part of November, 1838.—[*Inrolled in the Inrolment Office, June* 1839.]

What could induce Mr. Small to throw away his money in soliciting a patent, without first ascertaining whether the same had been done before, we cannot imagine,—but that it exhibits great negligence on his part, or that of his agent, is most evident, for the particulars of this manufacture were before the public when his patent was in an early stage of its progress.

To WILLIAM THOMAS SHALLCROSS, *of Holt Town, within the parish of Manchester, in the county Palatine of Lancaster, mechanic, for his invention of certain improvements in looms or machines for weaving cotton, linen, silk, woollen, and other fibrous cloths or substances.* —[Sealed 9th January, 1833.]

THERE are three features of improvement proposed under this patent,—first, an improved method of giving motion to the pecking sticks of a loom, in order to drive the shuttle with greater rapidity; second, a new mode of working the headles, which raise and depress the warp threads; and third, an improved mechanism for driving the work roller, by which the cloth is wound up as it becomes woven.

The patentee considers that the construction of a power loom being well understood, it is not necessary for him to describe one, but only to point out those variations in parts of the mechanism which he claims as improvements.

The mechanism by which the first object is to be effected, is represented in perspective upon a very small scale, and so indifferently described, that we can only understand that, on the end of the ordinary crank shaft there is a pinion which takes in to the crank wheel, and that to a pin in this wheel a connecting rod is attached, which is also attached to a double crank. Then follows a series of other wheels, rods, and cranks, which we have in vain attempted to put together, and that ultimately, the movements thus obtained, drives the pecker, and projects the shuttle to and fro.

Several variations of the arrangement of mechanism, all equally obscure to us;—and the patentee then says, that by these means he renders a loom less complicated than heretofore, and that by it, workmanship and materials are economised, and that the power required for driving it will be greatly diminished,—all of which if true, we regret that we have not been able to discover.

The other two features are rendered equally obscure by the smallness of the figures, the obscurity of the description, and the absence of letters of references in many parts; nor are we assisted in the claim with which the specification closes, as all the parts of the loom separately are disclaimed, and only the general arrangement considered to be new.—[*Inrolled in the Inrolment Office, July* 1833.]

To Edward Samuel, *of Liverpool, merchant, for his invention of improvements in the manufacture of soda.*—[Sealed November 13th, 1838.]

This invention is for improvements in certain processes in the manufacture of soda, which are described in the following manner. Take 116 parts of sulphate of barytes, with 40 parts of coal or coke, and having mixed them together, let them be roasted in an iron retort or kiln for some hours, until the sulphate of barytes becomes converted into sulphuret of barium, which as this sulphuret is soluble in water may be readily ascertained, and it will be found that about 84 parts of sulphuret of barium may be obtained from 116 parts of barytes.

The 84 parts of barium must then be taken from the retort or kiln and dissolved in hot water, and in a separate vessel, dissolve 72 parts of sulphate of soda. The sulphuret of barium is then added to the solution of sulphate of soda, and as decomposition takes place sulphate of barytes is precipitated, and the hydro-sulphuret of soda remains in solution. This hydro-sulphuret is then drawn off into a another vessel, and carbonic acid passes through it until it becomes saturated. This saturated solution is then evaporated to dryness, and the sub-carbonate of soda of commerce is obtained.

The patentee claims in the above process, adding sulphuret of barium to sulphate of soda in order to obtain mutual decomposition, and also passing carbonic acid gas through a solution of hydro-sulphuret of soda, obtained in the manner above described.

The second method of obtaining hydro-sulphuret of soda is as follows. Take any convenient quantity of sulphate of strontia, say 96 parts, and mix the same with about 30 parts of coal or coke, then roast them together in a retort or kiln until the sulphate of strontia becomes converted into a sulphuret of strontium; the quantity of sulphuret thus obtained will be about 60 parts. The sulphuret of strontium must be taken from the retort and dissolved in hot water, and when in solution it is to be added to a solution of 72 parts of sulphate of soda, previously dissolved in a separate vessel; a decomposition then takes place, and sulphuret of strontia will be precipitated, the hydro-sulphuret of soda remaining in solution. The hydro-sulphuret of soda is then to be drawn off into another vessel, and streams of carbonic acid gas passed through it; after which, upon being evaporated to dryness, the sub-carbonate of soda of commerce is obtained. The claim of novelty in this process, is adding sulphuret of strontium to sulphate of soda for the purpose of obtaining mutual decomposition.

In the third part of the invention the sulphate of soda is decomposed by means of hydrates of barytes and strontites, which may be obtained by boiling any metallic oxide with the sulphurets of strontium or barium. Oxide of copper is preferred, to which 84 parts of sulphuret of barium should be used for every 31 parts of copper, or 60 parts of sulphuret of strontium, to the before-mentioned quantity of copper. The claim as regards this part of the invention is, for adding the hydrates of barytes or strontites to the sulphate of soda, for obtaining mutual decomposition, and also for passing carbonic acid gas through an hydrate of soda, obtained by the decomposition of hydrate of barytes or strontites.

The fourth and last part of the invention is, for decomposing chloride of sodium, through the agency of oxalic acid. In order to effect this a saturated solution of common salt is mixed with a solution of oxalic acid, and the result will be that the greater part of the soda will be precipitated as an oxalate or binoxalate of soda. When the liquid is drawn off, the binoxalate of soda thus obtained should be exposed to a red heat, by which it immediately becomes converted into carbonate of soda, or else a sufficient quantity of carbonate of lime and water is mixed with it; and upon boiling the mixture a solution of carbonate of soda, and an insoluble precipitate of oxalate of lime is obtained. The solution is dried down, and upon being heated in a furnace, becomes carbonate of soda. The oxalate of lime may be decomposed by means of sulphuric acid, and the oxalic acid thus obtained may be used for a subsequent operation. The claim of novelty set forth, as regards this part of the invention, is the use of oxalic acid for separating soda from chloride of sodium or common salt.—[*Inrolled in the Inrolment Office, May* 1839.]

To ANDREW SMITH, *of Princes Street, Leicester Square, in the county of Middlesex, engineer, for his invention of certain improvements in the manufacture of ropes for cables, and other purposes to which ropes are applicable.* —[Sealed 20th March, 1839.]

THIS invention applies to that mode or method of making or manufacturing ropes, cords, or cable, in which several strands of material are *twisted* or *coiled one around the other*, as is the usual method of making ropes, cords, or cables of hemp or other fibrous materials. It consists in the *adaptation*, *application*, *and use of malleable iron or other metal wire*, in the making or manufacturing of cables, cords, and ropes, for mining and other purposes, and such like articles instead, or in *place of* hemp, flax, or other fibrous or textile substances, or materials, now commonly used; and which said fibrous substances or materials require to be first prepared, and spun, or twisted into strands, and then combined together to form the rope, cord, or cable, by twisting one or more strands around the others,—whereas by the use and application of malleable iron, or other wires, no such previous twisting or spinning of the material into single strands is required, as the wire is drawn by the usual method in sufficient length to allow of their being combined together in any number, either to form the several strands of a large rope or cable, or to be coiled into a single rope or cord composed of only one strand. My said improved ropes, cords, and cables, being more particularly applicable in situations where there is an excess of heat, of damp, or of friction.

I make these improved ropes, cords, or cables, in the following manner:—I first take any number of lengths of wire, of size or thickness, according to the purpose for which the rope is intended to be used, and combine them into a rope or cord, by twisting them together by any of the machinery commonly used for rope-making or twisting threads of fibrous substances together; and in order that my improved ropes may not be liable to oxidation in damp situations, I prefer coating or covering the wires with a solution of india rubber, or some mixture or compound of india rubber and other material, which will prevent oxidation, or that the wires should be coated or covered with tin, or zinc, or other metal not liable to oxidation, previous to their being used for this purpose.

After the wires have been twisted or combined into a rope, or cord, such rope or cord may be laid by the ordinary means into a thick cable; the whole may then be coated or covered with strips of canvas, leather, or other strong material, saturated in an india rubber solution or other waterproof composition, as a further protection to the wires.

I would here observe, that in cases where the several lengths of wire are not of sufficient extent to form the complete length of rope, the ends of two lengths of wire may be joined together, by laying or twisting their ends together or overlaying them a few inches; and in cases where this circumstance occurs, I prefer using lengths of wire of different extent, so that when they are combined to form a rope, the several joints may not come near together. Also I would remark, that these lengths or threads of wire should not be twisted or coiled so hard or close one upon another, as is done with ropes made of hemp or fibrous material, and that the strands of wire may be laid or coiled "cable-ways," or "hawser-ways," as is well known in common rope-making.

And lastly, that I do not claim as my invention the making or manufacturing ropes or cables of wire, when the strands are kept in straight lines, or nearly so, or parallel side by side, as these have already been invented and patented by me; but that which I do claim is, the adaptation, application, and use of malleable iron or other metal wire, to the making of ropes, cables, and such like articles, the said length of wire being twisted or coiled, and laid one around the other after the manner of ordinary rope-making, when strands of hemp or other fibrous material are employed, such strands or lengths of wire being protected from rust or oxidation by coatings of india rubber or other waterproof composition or material, or tin, or zinc, or other metals not so liable to be affected by rust or oxidation as iron.—[*Inrolled in the Rolls Chapel Office, September* 1839.]

Specification drawn by Messrs. Newton and Berry.

To William Horsfield, *of Swillington Mills, near Leeds, in the county of York, corn miller, for his invention of certain improvements in the construction of mills, for grinding corn.*—[Sealed March 19th, 1838.]

This invention is described by the patentee in the following manner. The section drawing fig. 1, Plate XIV, is given for the purpose of describing a corn mill with a pair of stones, working by under-gearing; and the section drawing fig. 2, is given for the purpose of describing a corn mill with a pair of stones, working by overhead or upper-gearing. I shall now first describe fig. 1, generally, and also with my improvements attached; and afterwards fig. 2, in like manner. A, in fig. 1, represents the top or revolving stone, and B, the bottom or fixed stone; C, the wooden frame or casing, by which the flour or meal is collected and conducted to the proper channel, to the sack or receiver; D, is the driving shaft standing upright in the adjustable step E, fixed into the lever F, which is held and supported by the screwed iron bolt and capstan-like nut G, G, in firm and sufficient frame work H, forming the usual means by which the revolving stone A, is brought closer, or set further apart, or made level whenever required; also the bush or collar I, which is firmly fixed into the centre of the bottom stone B, through which the driving shaft D, is held and turns, in order to give motion to the revolving stone A; the bevel wheels J, will shew where motion is given to the upright shaft D, by which means velocity is given to the revolving stone A, and the grinding process carried on.

The above described mill work is common to most corn mills, with driving action below the stones, and to no part thereof do I lay any claim. But of the following improvements I have every reason to be assured that I am the inventor, and do therefore claim as my own invention, viz., first, of a better method of fixing and carrying the top or revolving stone than has hitherto been used, viz., by a cross-armed cast iron frame, which I call the adjusting carrier for this reason, that by its means the stone may be so fixed, adjusted, and held by it, that when in full motion, it will be carried round in a perfect equilibrium,—a consequence which every practical miller knows how to value and appreciate,—and likewise, in a far superior and more complete method of feeding or keeping a pair of stones regularly supplied with corn for grinding, than by the very old plan of the hopper and chuff, which, by the adoption of my improvement, will be entirely done away.

K, fig. 1, represents the adjusting carrier in its proper place; the joint at L, is formed by a square hole or socket three or more inches deep, narrower at the top so as to fit exactly the conical or tapered square end of the upright driving shaft D, at L:—great care must be taken in fitting this joint, that the cross arms of the adjusting carrier K, runs quite square and level. The manner of fixing and hanging the stone to it, is by means of a flat cast iron circular plate M, (shewn more fully in the over-view fig. 3,) which plate is fastened very firmly to the revolving stone A, by four screwed bolts N, N, N, N, figs. 1, and 3, passed quite through or sunk into it: upon this plate also there are four cavities or recesses O, O, O, O, figs. 1, and 3, each made to fit an arm of the adjusting carrier K, and it is by passing a strong screwed bolt through this plate, in the centre of each cavity or recess, and also through each arm of the adjusting carrier K, shewn at P, P, P, P, figs. 1, and 3, which screwed bolts must each have a proper nut, and also an extra nut as a set nut, to secure the first nut from giving way; and it is by this means, and the screwing and unscrewing of these bolts and nuts, that the revolving stone A, is fixed, adjusted, and made to revolve in a true and perfect manner.

My improved feeder for a pair of stones, worked with under-gear, is shewn as Q, R, S, fig. 1. Q, is the pan or receiver with the conducting pipe R, screwed, or otherwise fastened to it; and S, a cast iron mouth-piece, somewhat in the form of a bell, but with a hole quite through it, and made to fit loosely upon the lower end of the conducting pipe R, so as to slide up and down, to be raised higher or brought nearer to the distributing plate T, which is cast in the middle of a funnel U, (shewn better in the over-view fig. 4,) having at the bottom four cavities or recesses 18, fig. 5, which are made to fit the four cross arms of the adjusting carrier, on which it is dropped on and fixed exactly over the eye or centre of the revolving stone A, and turns round with it. The distributing plate thus fixed, will, whether the stone runs quicker or slower, regulate the feeding accordingly in the most perfect manner possible.

To regulate the delivery when a more or less quantity is required from the feeder, the mouth-piece S, has a cross bar near the bottom inside, which is cast with it, and from a hole in the centre of which a wire rod V, with a head at the end, is passed through it and the conducting pipe R, and the pan and receiver Q, and jointed to a lever W, whose fulcrum is on the frame X, which is fastened to the ceiling or otherwise, and from the other end of which lever is jointed and hangs another wire connecting rod Y, which is passed through the floor into the room below or otherwise, where—by means of an index plate and a painted-headed screwed bolt, with a thumb or winged nut Z, when the quantity of meal ground in any given time is ascertained—an index may be formed, and the grinding process regulated to the greatest nicety, even by the meanest capacity. The feeder fig. O, is given to shew a different method of regulating the feeding, viz., by means of a sort of valve, made of iron or other metal, to fit the inside of the bell-formed end of conducting pipe R, through the centre of which, the same kind of wire rod V, is passed and acted upon in the same manner by the lever W, the connecting rod Y, the pointed-headed screwed bolt and thumb or winged nut Z, and the same object attained.

Having now given a description of a corn mill worked with under-gear, it will not be necessary to give so minute a description of a mill worked by over-head or upper-gear, except in those parts which are different in consequence of the driving shaft being above the stones,—I shall, therefore, use the same letters of reference to the drawing in figs. 1, and 2, wherein the objects in both are alike, and use arithmetical numbers in those parts which are different and require further explanation. No. 1, in fig. 2, represents the upright driving shaft, with the usual gearing 14, attached, and forked catch 2, at the lower end, held and supported by the usual plumer block, and having a centre pointed or rounded blunt-like point at the bottom end, made so as to fit a centered hollow or cup 4, made for that purpose at the top end of the lower shaft 5, which in this case is called the spindle,—but which, with the exception of its being shorter, and not having the driving gear attached to it, is in every other respect the same as the driving shaft D, before described in fig. 1, viz., it has the same conical or tapered square end as at L; it is held in the same kind of bush or collar I, fixed firmly into the centre of the bottom stone B; likewise stands into the like adjustable step or cup fixed on to the lever F, which is held and supported in like manner, by the screwed iron bolt and capstan-like nut G, G, in firm and sufficient framework H; and which also in the same way, forms the usual means for raising and depressing the revolving stone A, or making it level whenever required. The above mill work, as I have before stated, is common to most corn mills, and to no part thereof do I lay any claim.

Having before described the particular parts which I claim as my invention, in reference to corn mills worked by under-gearing, as in fig. 1, I shall now do the same, that is describe the particular parts I claim as my invention for corn mills worked by over-head or upper-gearing, in reference to drawing fig. 2, viz., the lower shaft or spindle 5, having the same conical or tapered square end L, the adjusting carrier K, is fixed exactly alike in both cases, so as to move round in a true and square manner, and the revolving stone A, is attached to it by means of the same circular cast iron plate M, (shewn more fully in the overview fig. 3,) by four screwed bolts N, N, N, N, figs. 2, and 3, passed quite through or sunk into it; having also the like four cavities or recesses O, O, O, O, figs. 2, and 3, made to fit likewise the four cross arms of the adjusting carrier K, where also in the centre of which four strong screwed bolts are made to pass through both as at P, P, P, P, figs. 2, and 3, each bolt as before explained, having a proper nut, and also an extra nut as a set nut; and with which means, and by the screwing and unscrewing of these bolts and nuts, the revolving stone A, is fixed, adjusted, and made to revolve in a true and perfect manner.

It now remains for me to shew how and in what manner the stone and under action receives its motion from the upper driving shaft 1. On reference to fig. 8, an overview representation of my adjusting carrier K, with two cavities or recesses 6, 6, one on each side of the boss or square hole or socket, into which the forked catch 2, at the bottom end of the upright driving shaft, is fitted and dropped in, and carried round with it, and thus motion is given to the lower shaft or spindle 5, the adjusting carrier K, the revolving stone A, and the grinding process carried on.

Any man of practice, experience, or mechanical knowledge, will know there must be a considerable difference in the construction of my principle of centrifugal feeding when applied to corn mills, with the driving action above the stones, than when below and quite out of the way, as in the before described principle in fig. 1. However, in making repeated experiments, I have contrived three different ways of adopting my plan of centrifugal feeding to the driving shaft, when above the stones, (see figs. 2, 10, and 12,) in which the pans or receivers, also mouthpieces and valves which encircle the shaft, are all represented as being cast in halves and screwed or otherwise fastened together, as shewn at 17, in figs. 2, 10, and 12, in order to their being set up or taken down whenever required, without disturbing the shaft; and the shaft should be turned true as far as the height they occupy, so that the hollow spaces, (shewn at 11, and 20, in the over-view figs. of the pans or receivers, 7, and 13,) where screwed or otherwise put together, form a clear passage for the shaft to turn in, without shaking the feeders.

The feeder represented at 7, 8, and 9, fig. 2, is what I should call a double one, and will be most suitable for very large stones: 7, is the pan or receiver; fig. 6, is a front view of the same, shewing how and where it is screwed together. On this pan or receiver are screwed or otherwise fastened two conducting pipes 8, 8, which are hung on each side of the driving shaft 1; the mouth-piece 9, which like the pan or receiver is also cast in halves, and when screwed together the two channels 12, 12, are made to fit loosely at the bottom ends of the two conducting pipes 8, 8, so as to slide up and down, to be raised higher or brought nearer to the distributing plate T, which in this case is also, with the funnel U, together, cast in halves with a hole in the centre to encircle the shaft,′ as shewn in the over-view fig. 9, which funnel has also four cavities or recesses, (18, fig. 5,) made as before described, to fit the four cross arms of the adjusting carrier K, on which it is dropped on and turns with it, being fixed in like manner exactly over the centre of the eye of the stone A; the distributing plate thus fixed will also, whether the stone runs quicker or slower, regulate the feeding accordingly, and in the most perfect manner possible.

To regulate the delivery when a more or less quantity is required, the two wire rods 10, 10, are made to pass through the iron at the bottom of the two channels of the mouth-piece 9, on which it hangs, and are also passed through the conducting pipes 8, 8, the pan or receiver 7, and connected to a double-headed lever 18, whose fulcrum is in a frame like unto the one at X, fig. 1, which is fastened to the ceiling or otherwise; and from the other end of which lever, is also jointed and hangs a wire connecting rod, in every respect like the same as shewn at Y, fig. 1, which is likewise passed through the floor or otherwise, having the same index plate, pointed-headed screw bolt, with a thumb or winged nut Z, affording the same means of accuracy and the like results.

The feeder shewn at fig. 10, is similar to one half the last described, as in fig. 2. The difference is, that in casting the two halves of the mouth-piece 14, the channel end must be made fast and tight to conducting pipe 8, and also room left for the kind of valve 15, to work loosely in, and to be moved up and down when required; which valve is also cast in two halves, and made to act together by means of teeth, made to fit nicely one within the other, (see fig. 11); the two halves of this valve are drawn up and let down when required, to regulate the feeding, by two wire rods jointed to each half 19, and to a double-headed lever, 20, fig. 10, whose fulcrum is also in a frame like the one at X, fig. 1, and is actuated from the other end by a similar wire connected rod Y, and index, and pointed-headed bolt, and thumb or winged nut Z, as before explained at large in fig. 1.

Fig. 12, is another mode of feeding. On this plan the mouth-piece T, fig. 1, and the pan or receiver, are cast or otherwise put together, which also must be formed or cast in two halves, and screwed or otherwise put togother, having a hollow space (20, figs. 12, and 13,) likewise for the shaft to turn in without disturbing it; and there is also two channels 21, 21, through which the corn passes to the distributing plate T, when the same accuracy in respect of regularity of feeding the stones is obtained. When the delivery of a more or less quantity is required, two wire rods 22, 22, are jointed to the edge or rim on each side of the pan or reeeiver, and to a double-headed lever 23, on which it is suspended. And the difference of this plan from the former is, that in regulating the feeding, the corn and the feeder together must be lifted with it. In every other respect it is actuated and regulated in exactly the same manner as the before shewn and explained method at X, Y, Z, fig. 1, and with the same precision.

I have now only to observe, that it will in a great measure depend upon the fancy or liking of the parties using my feeders, as to which of my plans I may be induced to put up; and as the same may be made either of tin, copper, brass, iron, or even of wood, it will likewise depend upon the same liking or fancy as to which of those materials they may be made of.—*Inrolled in the Rolls Chapel Office, September* 10*th*, 1838.]

Specification drawn by the Patentee.

To James Davis, *of Walcot-place, Lambeth, Esquire, for improvements in the manufacture of soap.*—[Sealed 23rd April, 1839.]

This invention is for combining fullers-earth, pipe-clay, and soda, and also pearl-ash, fullers-earth, and pipe-clay, with soap. The soda or pearl-ash employed in this manufacture must be calcined, by melting it and then allowing it to cool, after which it must be ground to as fine a powder as possible; the fullers-earth and pipe-clay should be well dried and ground to a fine powder. These ingredients are then to be intimately mixed with the pearl-ash or soda, and incorporated with the melted soap. The object of this invention is to take soap of the ordinary description and by means of fullers-earth or pipe-clay, or both of these articles, to obtain a vehicle for a larger quantity of alkali than is generally employed, which being calcined will, with such ingredients, when combined with common soap, produce a compound that will be found highly useful as a cleansing material, may be produced at a comparatively small cost, and may be used with sea or other water.

The patentee observes that he is aware that clays and earths have been incorporated with soap heretofore, but this invention only relates to incorporating fullers-earth and pipe-clay with soap, when such earths are combined with calcined soda or pearl-ash.

In order to produce a soap to be used in the woollen manufactures, or for general purposes, and washing in sea water, the following proportions must be observed. For every 126 pounds of soap, take 56 pounds of fullers-earth, dried or slacked, then add 56 pounds of pipe-clay, and 112 pounds of calcined soda. All these materials must be ground to powder and sifted as fine as possible. The 126 pounds of mottled or yellow soap, in a melted state, is then to be poured into a vessel containing the powder, composed of the above-mentioned materials, the whole being well mixed by stirring or grinding: the compound soap thus produced is then poured into frames to cool. It is here observed that great care should be observed in well combining the materials, and the mixing should be done as quickly as possible before the soap cools.

For a soap to be used for washing white linen in salt water, the fullers-earth is not employed. The proportions of the compound for this soap will be as follows:—for every 120 pounds of mottled or yellow soap, take 112 pounds of pipe-clay well dried, and add thereto 96 pounds of calcined soda reduced to powder, and mixed in the manner before described.

For producing a composition or soap for washing white linens in fresh water, the following proportions must be observed: For every 112 pounds of soap, take 28 pounds of pipe-clay well dried, and 36 pounds of calcined soda, which reduce to powder and sift as fine as possible,—pour the soap into the powder, and blend and mix as before.

Toilet and other fancy soaps are manufactured as follows:—for every 112 pounds of curd soap, take 28 pounds of fullers-earth, slacked or dried, and 20 pounds of calcined soda; add of scented oil according to fancy. The materials are finely ground, mixed, and formed for use as before described.

Calcined pearl-ash may be employed instead of calcined soda, and in precisely the same manner, but in about half the quantity; calcined soda is, however, to be preferred in making all soaps which in using come into contact with the skin, as pearl-ash is very irritating. The claim set forth is for incorporating fullers-earth, pipe-clay, and calcined soda or pearl-ash with soap, as above described.—[*Inrolled in the Inrolment Office, October*, 1839.]

Original Communication.

ON THE MODE OF PRODUCING FAC-SIMILE COPIES OF MEDALS, &c.—BY THE AGENCY OF VOLTAIC ELECTRICITY.

(To the Editor of the London Journal and Repertory of Arts, &c.)

Sir,—You request a condensed account of my voltaic process of working in copper. I shall endeavour to give you one, premising, I shall divest it as much as possible of electro-chemical detail, that it may be rendered quite intelligible to those unacquainted with that science.

It has been long known that one metal will precipitate another from its solution. As one instance, if we take a solution of sulphate of copper, the blue vitriol of commerce, and dip the blade of a penknife in it, in a few seconds it becomes coated with pure metallic copper. We have here an instance of simple electro-chemical action, and I may say, the type of all the experiments I have lately published on the subject. Subsequently, it has been found that copper itself possessed this quality, by acting on *its own* solutions, and to a much greater extent than in the first instance, but under a somewhat different condition.

If we take a clean copper wire and dip it into a solution of the sulphate of copper, on taking it out, we find no perceptible difference is made on its surface. If we now take the copper wire, or slip of that metal, and solder to one of its ends a piece of zinc, and bend the two metals so combined into the shape of the letter U, and again place the copper end in the cupreous solution, and the zinc end in a very weak solution of salt and water,—if allowed to remain some time, it will be found the copper end has received a thin coating of solid copper. In this instance, as in most others connected with continued galvanic arrangement, it is a *sine qua non*, that the two fluids must *not* be allowed to intermingle, yet must be *in* connection with each other.

To effect this, various expedients have been resorted to, with more or less success; but to give a simple illustration of how this may be effected, in order to attain the result mentioned above, take a piece of *stout* brown paper, and bend it into the form of a piece of tube about three inches long, and perhaps an inch in diameter. This may be conveniently done, by bending the paper round a phial to make it assume the desired form; let the edges of the paper overlap, and fasten them together with a bit of sealing wax. A paper tube is thus obtained, open at both ends, but one end must be closed; this may be done simply, by cutting a piece of card into the shape of the bottom end, but a little larger, and fastening it on with sealing wax, just as we would take an impression of a seal, by covering the disc of card with the wax, and while soft dip the end of the paper tube into it; when set, we shall thus obtain a vessel capable, to a certain extent, of containing a fluid, yet from its porous texture, this fluid would be in connection with any other fluid that might surround it on the other side.

Having obtained such a tube, we three parts fill it with salt and water, or better still, glauber salt and water, which is a sulphate of soda. We then take a common drinking tumbler, containing a quantity of sulphate of copper in solution, and take the paper tube containing the saline solution, and immerse it in the tumbler, taking care that both fluids shall attain the same level. If we now take the bent slip of copper and zinc, and place the copper end of it in the cupreous solution, and the zinc end in the saline solution, contained in the paper tube, and let this remain at rest for a few hours (if in a warm situation so much the better) it will be found on removing the combined pieces of metal, that the copper end has obtained a solid covering of pure copper. I have here described an elementary voltaic battery,—and the most extensive one ever constructed, is only a combination of such simple arrangement connected together by copper wires.

In this arrangement the inside of the paper tube, containing the saline solution, is termed the positive cell,—the outside one—the tumbler containing the cupreous solution—is termed the negative cell. The zinc end of the combined metals, is termed the positive electrode,—the copper end, the negative electrode. With a modification of this very simple apparatus, all the experiments of this process may be readily performed. I have judged the above explanation necessary, as many persons have imagined the apparatus when constructed, was in some way or other connected to a galvanic battery.

By performing the above experiment, we acquire a clear idea of voltaic arrangement, while the eye becomes acquainted with the phenomena produced.

Were I required to produce an exact fac-simile of a medal in copper, I should proceed as follows:—Suppose it were equal in size to half-a-crown, — I should procure a piece of glass tube, (a short gas glass of the largest diameter does best) and then take a piece of flat glass and oil its surface slightly,—this done, I place one end of the tube on the oiled glass, and pour into it some fluid plaster of paris, to the depth of $\frac{1}{2}$ or $\frac{5}{8}$ths of an inch; when this sets, the oiled glass will slip easily off, and a porous bottom will thus be given to the tube, which in all cases should be of equal or superior diameter to the medal required to be copied. This, and a common size drinking tumbler, comprehends nearly all the apparatus required.

I should now procure two pieces of pretty thick sheet lead, and with a plane, smooth one of the surfaces of each piece, in the manner wood is planed. I then take the medal to be copied, and place it between the bright surfaces of the pieces of lead, and place the whole under a press. Should the medal not be very large, a copying press will be found sufficient, but when larger, a more powerful one is requisite. In either case the object to be acted on must be under the centre of pressure.

When removed from the press, a most exact mould of each side of the medal will thus be obtained. I now take a piece of copper wire, varying in length according to the size of the apparatus,—in the present instance, from 12 to 16 inches may be used.—To one of its ends, I solder a piece of zinc, rounded, and sufficiently large to go into the gas glass. To the other end I solder* one of the leaden moulds. I have now what is termed a "galvanic pair," the leaden mould constituting the negative electrode, and the zinc the positive one.

The wire is now bent in such a form, that the lead and the zinc will be opposed to each other,—the opposed surfaces being distant about 1½ inches. To effect this, bend the wire into a right angle, at its junction with the lead, and place the lead in a horizontal position, at the bottom of the tumbler,—the impressed side being uppermost. The gas glass, with its plaster bottom, must now be placed exactly over the lead mould.† The wire must again be bent in the shape of the letter u, in order that the zinc end may go into the gas glass, and *touch*, or nearly so, its plaster bottom. This like the lead, must lay horizontally, on the bottom of the interior cell. To conveniently effect this, the end of the wire should be soldered to the centre of the zinc disc.

These arrangements being neatly effected, I now pour a hot saturated solution of sulphate of copper into the tumbler, being in connection with the lead.—A few undissolved crystals may be added with advantage.—I next pour a hot solution of glauber salt into the gas glass, in connection with the zinc, taking care it does not exceed the level of the fluid in the outside cell. This latter solution must not be saturated, but only a few crystals of the salt put in the water. This may now be allowed to remain for a day or two, until the blue colour of the cupreous solution is assuming a pale green; then add a few crystals of the salt of copper.—Should a very thick deposition of copper be required, it is well to renew the solutions entirely, as the acid that is set free, materially interferes with the success of the process.

This process may be quickened in a very great degree, by the application of heat, and the metal so deposited, is of a much superior character to that deposited under a common temperature. The apparatus I have described, may be kept at a temperature of from 120 to 160°, by being placed at the side of a fire, and a deposition got in a very few hours,

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* The wire should be soldered to the blank side of the lead.

† In order that the gas glass may not *rest* on the plate to be deposited on, I suspend it by a wooden collar, which rests on the outside vessel, and keeps the bottom of the inside one, at a quarter of an inch distance from the plate.

When it is judged the requisite thickness is deposited, I proceed to get the copper so deposited, off the mould, as follows:—Previous to immersing the lead into the solution, I generally varnish the back and edges of the mould, to prevent deposition on any other portion of its surface than that opposed to the zinc.

On removing it from the apparatus, I file the edges of the copper until they are flush or parallel with the lead. I then heat the copper side by holding it over the fire, and suddenly plunge it in cold water. On examination it will be found some portion is loosened from the lead, when, by inserting the edge of a knife, the plate of copper will come readily off, bearing a *most exact* impress of the original.

I have thus far described how to proceed, in the progress of taking a single medal; but it will at once be perceived, that the same instructions apply to a sheet containing an indefinite number, by only enlarging the apparatus. By exactly the same process here described, I have succeeded in obtaining exact copies of engraved wood blocks and copper plates. I have also succeeded in stereotyping in copper, some elaborate ornamental printing, equal in area to a large octavo page.

I have used lead for most of my latter experiments, instead of copper,—as that metal precipitates copper, when in connection with zinc, and it is much easier got off the mould, in consequence of the different degrees of expansibility possessed by the two metals, on the application of heat. The time occupied by the whole process, is also materially abridged. I have not yet had an opportunity of trying the "fusible metal," that melts at a temperature of 212° Fahr. It must also be borne in mind, that as far as our knowledge extends, it is an electro-chemical law, that a *metallic* surface must be present, before we are able to precipitate a metal from its solution.

Want of space compels me to omit several minutiæ, that my experience has suggested, but enough has been said to illustrate the principle, and I may add, it it is susceptible of infinite variation.

I have every reason to believe it might be found advantageous to type founders, for the matrix from which they cast type, as copper precipitates very readily, on a surface of type metal.

In conclusion, I may add,—I have no personal intention of turning this process to pecuniary advantage,—should it be capable of being so applied, but should at all times feel happy in communicating my experience of the matter to those desirous of applying it in the arts.

My own expectations have been fully realised, as it has been a means of illustrating a hitherto unsolved geological problem, in connection with some peculiar views I hold on the subject.

THOMAS SPENCER.

LIVERPOOL, DEC. 14th.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

"On Steam Boilers and Steam Engines."

(Continued from p. 256, Vol. XV.)

The effect of a different practice as regards rapidity of combustion and arrangement of parts, entirely disturbs the relation betwixt boilers of equal surfaces; the table shews an almost pefect identity in the total, the radiant, and the communicative areas, between the mean of eight experiments on the wagon and eleven on the locomotive boiler, and the locomotive boiler would present between 3 and 4 times greater surface to absorb the heat generated on the grate than the wagon, if the rate of combustion were the same in both, but the rate of combustion is seven times more rapid in the locomotive, and consequently the locomotive does not offer one-half the surface of the wagon boiler for the absorption of the heat produced from equal weights of fuel in the same time. The result of this discordant practice is a loss by the locomotive of one-third of the heat which is realized in the wagon boiler; that the rate of evaporation from equal surfaces is augmented in the locomotive by 65 per cent., so that the increase of evaporative power is attended by a sacrifice of 33 per cent. of fuel.

The locomotive possesses peculiar advantages in the thinness of the metal composing the tubes, and the sub-division of the heat, but these are more than neutralized by the exceedingly short period of the duration of the heat, from any given quantity of fuel about the boiler. This most important subject of time is discussed in a series of propositions based on the following principles:—The structure of the boiler and its mode of setting occasion the heat to travel greater or less distances, and over very unequal extents of surface in equal times, and the value of time will be appreciated by referring it to the rate of combustion, to the distance passed over by the products of combustion before they quit the boiler, the time in which the heat traverses the boiler, and to the period of the duration of the heat about equal areas of surface. These remarkable elements give rise to eleven propositions, which are fully discussed and illustrated by tabulated results. The peculiar action which takes place on the metal of the boilers is indicated by the phrase *intensity of the calorific action*, since there are involved many actions which are entirely independent of the temperature of the fire. The relations furnished by some of these propositions are facts as regards the relative action of the fires, and furnish appropriate measures of the effects of different systems of practice on the durability of the boiler.

The preceding abstract having been read, Mr. Parks remarked there were so many elements to be taken into consideration—the evaporation was affected by so many circumstances—there were so many things left untold—that he hoped some of the many who were capable of making experiments would give their assistance. Every day's work was an experiment which ought to be carefully registered. He had great difficulties on many points, particularly with respect to the locomotive boiler and the thinness of the heat-absorbing surface. It had been stated on a preceding evening that Dr. Ure had proved, if two vessels of equal size, the one of thin and the other of thick metal, be placed in a sand bath, there will be more water evaporated in a given time by the thicker than by the thinner vessel. This was very extraordinary, since he thought that 25 per cent. would be lost in the locomotive boiler if the tubes were of double the thickness. The effect of thickness of the material was evident in the experiments which every boy has made with the paper boilers over a candle. The real cause of the destruction of boilers is the application of heat to thick surfaces. Another subject of peculiar importance is the temperature at which the heat leaves the boiler and enters the chimney. He had made experiments on this at Warwick, and proved that he could not boil the water in a vessel at the top of a chimney 60 feet high; the temperature never exceeded 180° F. It was argued that more of this heat could not be used, but the Cornish engineers had shewn that to be an error, having surpassed his results.

Another subject is the constant loss of heat by radiation; he had attempted to ascertain this with Mr. Wicksteed; the boilers at Old Ford were covered with cinders, so that but little radiation would take place but from the front or bed; still the quantity of heat which goes off is considerable, and one great source of waste. They had observed with great care the quantity of coal requisite to keep the boiler hot; this would furnish some measure of the loss due to radiation.

The attention of the meeting having been called to M. D'Harcourt's artificial granite for railways, blocks, and other purposes, Mr. Rastrick remarked that he had about a month ago laid down blocks of the Scotch Asphalte, two feet square, on a portion of the Southampton Railway. The sleeper was put in while the block was formed. It was usual to bore holes and to fix the chairs by bolts; he had wished to ascertain how far the blocks would stand the driving in of the bolts, without any boring; they bore this without any apparent injury, and he thought these blocks, weighing about 3¾ cwt. would answer the purpose better than blocks to other materials.

April 30, 1839.

The President in the Chair.

"On the supply of Water from Artesian Wells."

By R. W. Mylne.

Artesian wells, so called from their having been originally adopted in the province of Artois, by the Romans called Artesium, are usually made by boring vertically through a deep stratum of clay into one of sand, which generally contains water. The water will rise to a considerable height, depending on the elevation of the point at which the sand stratum crops out from under the bed of clay. The London basin is peculiarly adapted for these wells, as on the large bowl of chalk is a thick lining of sand, supporting a deep bed of clay, known as the London blue clay. On boring into this sand, or into the chalk, the water rises to various heights, and it has been thought that an abundant supply for the metropolis might thus be obtained. With the view of ascertaining what dependence can be placed on this source, the New River Company sunk a well, the details of which form the subject of this communication. Before entering on these the author mentions several instances of wells supplied from the *sand springs* in various parts of the metropolis, and other parts of the country. In most of these the supply has been so affected by neighbouring wells, or the upper ground and buildings have been so endangered by the large cavities produced in consequence of the fine sand being pumped away, that the wells have been abandoned. Several remarkable instances of the effects of this subsidence are detailed in this communication. Experience thus appearing to shew that little dependence can be placed on the sand springs, it has been been suggested to sink through into the chalk; but the supply from this source also is affected in a remarkable manner in various cases.

The author then proceeds to give the particulars of the sinking of the well in the Hampstead Road. In March, 1835, an excavation, 20 feet in diameter, and 23 feet deep, was made; the sides were supported by wooden curbs with puddle at the back, so as to shut out the land springs. At the bottom of the curbs, just in the blue clay, a cast-iron footing was added, and a brick shaft of 12 feet 6 inches diameter carried up to the surface of the ground. The excavation was continued for 59 feet through the clay, steined with 9-inch brick work in cement, iron rings were placed at every 8 feet of the brickwork, and of a greater diameter than the shaft, and projecting into the clay a few inches so as to support the shaft in its progress; the brickwork was continued through 57 feet only, leaving 2 feet of clay for a a foundation. The excavation was now reduced to 10 feet 9 inches, for the purpose of introducing cast-iron cylinders formed of six segments, 6 feet in length, united by bolts through flanches on the inside, and leaving 9 feet 9 inches clear diameter. These being joined together were forced down by hand screws, as the sinking continued through the 2 feet of blue clay and through 10 feet of soft mottled clay, at the bottom of which water appeared.

The well was kept dry by an engine and two 8-inch pumps in two lifts, and the sinking continued for 8 feet, through a bed of fine brown sand. Cavities were now discovered behind the cylinders, which were forced out of the perpendicular by the unequal pressure, and became completely jambed. A second set of cylinders was now prepared, and the sinking continued for 26 feet through the remainder of the dark brown sand, soft mottled clay, a thin layer of pebbles and black sand closely embedded, and 4 feet 6 inches of dark brown sand. Cavities again formed at the back, and the cylinders became jambed.

A third set of cylinders was now prepared, of 7 feet 4 inches diameter, and the sinking continued through 7 feet of dark brown sand, and 5 feet of dark quicksand, when they again became jambed. During the latter portion of the work great difficulty was experienced from the blowing of the sand, often to the height of 6 feet; this occasioned large cavities behind the cylinders and the brickwork; several segments of the former were broken at their vertical flanches, and the lower part of the latter was much cracked. A large cavity also was formed at the back of the brick shaft about 60 feet from the surface. The settlement of the ground at the surface was so extensive that the pumping was discontinued until the plan suggested by Mr. Simpson, of continuing the sinking with the water in the well, was adopted.

For this purpose, in August, 1836, a wrought-iron cylinder, 62 feet long, and 5 feet 10 inches diameter, formed of boiler plate, was lowered to the surface of the sand, which had become consolidated under the pressure of the water, and was removed by an instrument called a miser, which holds about two bushels. The cylinder was forced down by hand screws on its upper edge, through the remainder of the quicksand stratum, through a bed of sand with flints and pebbles, and through a bed of chalk and flints, into the chalk to a depth of 12 inches. The water and sand being now shut out, the well was dried, and in March, 1837, the sinking continued in the usual manner to a total depth of 183 feet, the chalk being sufficiently indurated not to require lining. The water now increased considerably, and the chalk was excavated to an enlarged diameter below the bottom of the wrought-iron cylinder, for the purpose of forming a brick footing. On the top of this was placed a broad cast-iron ring, upon which rested a series of cast-iron cylinders of a clear diameter of 4 feet 7 inches, which were introdnced within the wrought-iron tube, for the purpose of strengthening it, and guarding against the admission of sand in case of its failure from corrosion.

In February, 1838, the works being complete, the pumps of 12 inches diameter were introduced in two lifts; and in August, 1838, when the springs were short, and in March, 1839, when the springs were at their best, an experiment of two weeks was made; the result of the former was 14,898, and of the latter, 30,499 cubic feet per day of 24 hours. The total expense of the well was £12,412. 14s. 1d.

The paper is accompanied by a copy of the report of James Simpson, Esq. in which the plan adopted for the completion of the works is recommended. Mr. Simpson details the difficulties which had been met with, and particularly the extensive subsidence of earth caused by the removal of the sand. This far exceeded the quantity due to the contents of the well at the lower sand stratum, and the subsidence proceeded most rapidly when the water was pumped out of the well. The experience of wells near the metropolis shews that the springs in the chalk are much more abundant than in the sand, but in order properly to take advantage of them, adits must be driven to collect the water from the fissures in the cavernous structure of the chalk. The report proceeds to speak of certain methods of securing the present works, and of prosecuting them by either driving an iron pile curb or sinking iron cylinders cast in entire circles. The former could not be recommended, as a considerable further subsidence would be the consequence, and the shaking of the ram would endanger the works. The latter method might be adopted: it is performed with common boring rods and tools, the shells or buckets are fitted with valves opening upwards, and the material is raised by them with the greatest ease. When the cylinders become set, or when they do not sink in proportion to the material removed, they are slightly jarred by a heavy sledge hammer. The advantage of keeping the water in equilibrium inside and outside the cylinders is very great, and the method has been in many cases peculiarly successful.

The paper is accompanied by a section of the works and the strata, and by drawings of the various tools employed.

Mr. Brunel stated, that the succession of the strata here described was nearly the same as they had met with at the Tunnel.

Mr. Simpson remarked, that the greatest caution was requisite in drawing conclusions respecting the strata in one part of the metropolis from what was known of it in another part. At Lambeth, for instance, in the same shaft, there might be gravel on one side and sand on the other, and the London clay is here about 32 feet below Trinity high-water mark: near Chelsea College the London clay is met with at the depth of 38 feet, after passing through sand and gravel; and a little farther on, in the King's Road, the clay is reached without passing through any sand, and in this locality the chalk is touched at 245 feet below Trinity high-water mark. It was a remarkable fact that they should have reached chalk at so small a depth in the Tottenham Court Road well. The alterations in the strata are so great, that no one who has had any experience of wells will venture to infer from one place what will occur at another. The engine employed at this well was a twenty horse, and worked at an expense of about £2. 7s. per 24 hours. This, however, is a very small part of the expense of supplying water to houses, as the water has to be raised to the houses, and the cost of pipes must be included. It was not very intelligible how water was to be raised from so many feet below high-water mark, and supplied at the same cost as water taken from the Thames at the level of high water.

May 7, 1839.

The PRESIDENT in the Chair.

'The Sewage of the City of Westminster, described and delineated.'

By John E. Jones, A. Inst. C. E.

This communication, consisting of a large map, plans, sections, and tables, with a description of the Sewage of the City of Westminster, is prepared in consequence of the Council having directed attention to the great importance of this subject.

The author having remarked on the magnitude of the subject, on the defective state of the legislative enactments, and on the necessity of employing in works of such importance the most eminent professional assistance, as has been recently done by the

Commissioners of this district, directs his observations to the following subjects:

1.—The history of Sewage, embracing the progress of legislation on Sewage or Drainage to the present time.

2.—The principles of Drainage as applied to Westminster in particular.

3.—An explanation of the Map, Plans, Sections, and Tables.

1.—In the earlier statutes and writers on this subject, the word sewage or sewerage is identical with drainage, as appears particularly from the act of Henry the Eighth, which is the general sewage act, by which the commissioners of sewers are now guided, being for the most part applicable to fen land drainage. The metropolis and adjacent districts, comprehended within a distance of ten miles of the Post Office, are divided into seven distinct and independent trusts, whereof five are administered by local acts, the other two by the general sewage act first alluded to. The sewers falling into the Thames within two miles of London, are, by the 3d of James the First, placed under the commissioners of sewers, and the 47th of George the Third defines and declares the powers given by the act of James. This statute, passed in 1807, was not acted on to any extent till 1813, the interval being employed by the commissioners in requisite arrangements. The difficulties with which they had to contend, owing to the rapid demands for additional drainage, the defective state of the old works, and other causes, being considered, the conclusion of the Committee of the House of Commons,—" That whatever the defects of the laws of sewers may be, they appear to have been administered of late years with good faith and integrity on the part of the commissioners,"—appears fully justified.

2.—The principles of drainage, or of conducting the superflous waters to their proper outlets, are few and simple; but in the drainage of a town, the masses of buildings of all ages and all kinds of various levels, the concentrated mass of filth, and the numerous conflicting interests, conspire to make the establishment of an efficient system of sewage, one of the most difficult, as it is one of the most important objects to which the skill of man can be directed. One great difficulty has arisen from the commissioners not being invested with powers enabling them to originate new lines of sewers, but being confined to improving those that exist, and controlling the construction of new ones. A large portion of Westminster is below the level of high-water, and the drainage of buildings being optional on the part of the builder, there consequently exist insulated houses and districts of loathsome filth, for want of sufficient compulsory powers on the part of the commissioners. The obvious remedy for these evils is, to give powers to the commissioners of sewers within their districts to compel every person to drain his property in an effective manner under their approval, and to form such new main lines as circumstances may render necessary, and to impose general rates for their maintenance.

3.—The large plan or map is a delineation of the city of Westminster, compiled from original surveys in the possession of the commissioners of sewers, and laid down to a scale of one inch to two hundred feet; the boundaries of the city and of the several parishes, of the main lines of sewers, and of the collateral sewers, are marked with different coloured lines, so as to be readily distinguished; the sewers of different dates are also distinguished by particular colours; and the whole plan is divided into districts, and coloured in various ways, so that a most comprehensive and distinct idea may be at once obtained of the principal or main sewers by which the waters of this portion of the metropolis are received. This plan also exhibits a section of the Regent's Park Tunnel, and of the King's Scholar's Pond Sewer.

Professor Wallace exhibited a pentograph of a novel construction, by which drawings may be copied or reduced and etched with great facility. Mr. Macniell bore strong testimony to the advantages of this construction over every other which he had seen, and stated that it had enabled him to finish a plan in 3½ hours, which he could not have finished with an ordinary pentograph in less than 12 hours.

List of Patents

Granted for Scotland between the 22d November and 22d December, 1839.

To Thomas Kerr, of Forecrafts, Dunse, for a new and improved mortar or cement for building, and other purposes.—Sealed 23rd November.

William Miller, of Clitheroe, county of Lancaster, engineer, for certain improvements in grates used in steam-engine, or other furnaces or fire-places.— Sealed 5th December.

John Swindells, of Manchester, manufacturing chemist, for certain improvements in the manufacture of Prussian blue, prussiate of potash, and prussiate of soda.—Sealed 5th December.

Francois Vanillon, of Princes-street, Hanover-square, London, silk mercer, (communicated by a foreigner residing abroad), for improvements in the manufacture of ornamental woven fabrics.—Sealed 6th December.

George Lowe, engineer in the Chartered Gas Company, and to John Kirkham, engineer to the Imperial Gas Company, both of London, for improvements in the manufacture of gas for the purposes of illumination.—Sealed 6th December.

John Juckes, of Shropshire, gentleman, for improvements in furnaces and fire-places, for the better consuming of fuel.—Sealed 12th December.

Moses Poole, of Lincoln's-inn, gentleman, (communicated by a foreigner residing abroad), for improvements in looms for weaving.—Sealed 12th December.

Charles Dod, of 21, Craven-street, Strand, London, (communicated by a foreigner residing abroad), for certain improvements in the construction of railways and tram-roads, and in the carriages to be used thereon and otherwise.—Sealed 18th December.

Charles Cowan, of Pennycuick, paper manufacturer, and Adam Ramage, of Valleyfield, of the same place, for improvements in machinery used in the manufacture of paper.— Sealed 19th December.

William Palmer, of Sutton-street, Clerkenwell, London, lamp maker, for improvements in lamps, and in the manufacture of candles.—Sealed 21st December.

John Sutton, of John-street, Roupell-street, Lambeth, machinist, for improvements in obtaining power.—Sealed 21st December.

Ambrose Rowden Johns, of Plymouth, artist, for improvements in colouring or painting walls and other surfaces, and preparing materials used for that purpose.—Sealed 21st December.

Antonio James Mayer, of Ashley Crescent, London, for an improved machine for cutting splints of matches.—Sealed 21st December.

New Patents
SEALED IN ENGLAND.
1839.

George Davey, of Llandudno, Carnarvon, mining agent, for an improved mode of applying water power.—Sealed 2nd December, 1839—6 months for inrolment.

Luke Hebert, of Birmingham, patent agent, for improvements in the mechanism and process of packing and pressing various articles of commerce, being a communication.—Sealed 2nd December—6 months for inrolment.

Miles Berry, of the Office for Patents, Chancery-lane, patent agent, for certain improvements in machinery or apparatus for making or manufacturing pins and sticking them in paper.—Sealed 2nd December—6 months for inrolment.

Godfrey Anthony Ermen, of Manchester, cotton spinner, for certain improvements in machinery or apparatus for spinning, doubling, or twisting cotton, flax, wool, silk, or other fibrous materials, parts of which improvements are applicable to machinery in general.—Sealed 2nd December—6 months for inrolment.

John Evans, of Birmingham, paper maker, for improvements for chemically preparing and cleansing of felts used by paper manufacturers.—Sealed 2nd December—6 months for inrolment.

Henry Dunington, of Nottingham, lace manufacturer, for improvements in machinery employed in making frame-work, knit, or stocking fabrics.—Sealed 2nd December—6 months for inrolment.

James Guest, Junior, of Birmingham, merchant, for improvements in locks and other fastenings, being a communication.—Sealed 2nd December—6 months for inrolment.

George Saunder Clerk, of Hooknorton, Oxford, and James Wilmot Newberry, of the same place, farmer, for improvements in machinery for dibbling or setting wheat and other grain or seed.—Sealed 2nd December—6 months for inrolment.

Henry Trewhitt, of Newcastle, Esq., for certain improvements in the fabrication of china and earthenware, and in the apparatus or machinery applicable thereto, being a communication.—Sealed 4th December—6 months for inrolment.

Christopher Nickels, of York-road, Lambeth, gentleman, for improvements in propelling carriages, being a communication.—Sealed 4th December—6 months for inrolment.

Pierre Narcisse Cronier, of Fricourt's Hotel, St. Martin's-lane, for improvements in filters, and in the means of cleansing the same, and for separating, colouring, and tanning matters by filteration, and for improvements in employing such tanning matters by filteration, being a communication.—Sealed 4th December—6 months for inrolment.

James Mayer, of Ashley Crescent, St. Luke's, gentleman, for an improved machine for cutting splints for matches.—Sealed 4th December—6 months for inrolment.

George Lowe, engineer to the chartered gas company, and John Kirkham, engineer to the imperial gas company, both of London, for improvements in the manufacture of gas for purposes of illumination.—Sealed 4th December—6 months for inrolment.

James Nasmyth, of Patricroft, near Manchester, engineer, for certain improvements applicable to railway carriages.—Sealed 4th December—6 months for inrolment.

John Heaton Hall, of Doncaster, chemist, for improvements in preserving and rendering woollen and other fabrics, and leather, waterproof.—Sealed 5th December—6 months for inrolment.

Harrold Potter, of Manchester, Esq., for certain improvements in printing calicoes, muslins, and other fabrics.—Sealed 9th December—6 months for inrolment.

Samuel White White, of Charlton Marshal, Dorset, Esq., for improvements in preventing persons from being drowned.—Sealed 9th December—6 months for inrolment.

Moses Poole, of Lincoln's-inn, gentleman, for improvements in the manufacture of caustic, soda, and carbonate of soda, being a communication.—Sealed 9th December—6 months for inrolment.

Thomas Richardson, of Newcastle, chemist, for a preparation of sulphate of lead, applicable to some of the purposes for which carbonate of lead is now applied.—Sealed 9th December—6 months for inrolment.

John Leslie, of Conduit-street, Hanover-square, tailor, for improvements in measuring the human figure, being a communication.—Sealed 9th December—6 months for inrolment,

John Juckes, of Shropshire, gentleman, for improvements in furnaces or fire-places, for the better consuming of fuel.—Sealed 9th December—6 months for inrolment.

Pierre Frederic Gongy, of Tavistock-street, Westminster, Watch-maker, for an improvement in clocks, watches, and other time-keepers.—Sealed 11th December—6 months for inrolment.

Robert Hervey, of Manchester, drysalter, for certain improvements in the mode of preparing and purifying alum, alumina, aluminous mordants, and other aluminous combinations and solutions, and the application of such improvements to the purposes of manufacture.—Sealed 13th December—6 months for inrolment.

Robert Gill Ranson, of Ipswich, paper-maker, and Samuel Millbourn, foreman to the said R. G. Ranson, for improvements in the manufacture of paper.—Sealed 13th December—6 months for inrolment.

Angier March Perkins, of Great Coram-street, civil engineer, for improvements in apparatus for transmitting heat by circulating water.—Sealed 16th December—6 months for inrolment.

Jacob Brazill, Governor of Trinity Ground, Deptford, for improvements in obtaining motive power.—Sealed 16th December—6 months for inrolment.

Henry Seymour Moore Vandeleur, of Kilrush, Ireland, for improvements in paving, or covering roads and other ways.—Sealed 16th December—6 months for inrolment.

Samuel Walton Faxon, of Park Village, East, Regent's Park, surgeon, for an apparatus to be applied to the chimneys of gas and other burners, or lamps, to improve combustion.—Sealed 16th December—6 months for inrolment.

Monnin Japy and Constant Jouffroy Dumery, of George-yard, Lombard-street, gentlemen, for improvements in rotatory engines, to be actuated by steam or water.—Sealed 16th December—6 months for inrolment.

David Morison, of Wilson-street, Finsbury, ink maker, for improvements in printing.—Sealed 16th December—6 months for inrolment.

David Naylor, of Copley Mill, Halifax, manufacturer, and John Crighton, junior, of Manchester, machine maker, for certain improvements in machinery for weaving single, double, and treble cloths, by hand or power.—Sealed 16th December—6 months for inrolment.

George Wilson, of Salford, machinist and engineer, for certain improvements in steam whistles, adapted for locomotive engines and boilers, and other purposes.—Sealed 16th December—6 months for inrolment.

John Wood, of Burslem, Stafford, manufacturer of mineral colours, for a new method or process in the application and laying on of the substances used in the printing, colouring, tinting, and ornamenting of china, porcelain, earthenware, and other wares of the same description, by which such wares can be painted and ornamented with flowers and other devices, in a much cheaper and more simple and expeditious manner, than by any process now in use,—and colours of all or any variety may be painted, shaded, mixed, and blended together, in one of and the same design or pattern, and hardened or burnt into the substance of the aforesaid wares, by a single process of firing or hardening in the enameling kiln.—Sealed 16th December—2 months for inrolment.

James William Thompson, of Turnstile-alley, Long Acre, upholsterer, for improvements in the construction of bedsteads, which improvements are particularly applicable to the use of invalids.—Sealed 16th December,—6 months for inrolment.

William Newman, of Birmingham, brass founder, for certain improved mechanism for roller blinds, which it is intended to denominate "Simcox and Company's Patent Blind Furniture."—Sealed 16th December—6 months for inrolment.

John Robinson, of North Shields, engineer, for an improved steering apparatus.—Sealed 16th December—6 months for inrolment.

Joseph Gibbs, of Kennington, engineer, for an improvement or improvements in the machinery for preparing fibrous substances for spinning, and in the mode of spinning certain fibrous substances.—Sealed 21st December—6 months for inrolment.

George Lindsay Young, of Hackney, gentleman, for an improved surface for paper, mill or card-board, vellum, and parchment.—Sealed 21st December—6 months for inrolment.

Henry Francis Richardson, of Ironmonger-lane, gentleman, for improvements in omnibuses.—Sealed 21st December—6 months for inrolment.

John Cutts, of Manchester, machine maker, and Thomas Spencer, of the same place, mechanic, for certain improvements in the machinery or apparatus for making wire cards for carding cotton, silk, wool, and other fibrous substances. —Sealed 21st December—6 months for inrolment.

Laurence Wood Fletcher, of Chorlton upon Medlock, Manchester, machinist, for an improvement or improvements in the manufacture of woollen and other cloths, or fabrics, and in the application of such cloths or fabrics to various ueful purposes.—Sealed 23rd December—6 months for inrolment.

Thomas Firmstone, of Newcastle, Stafford, coal master, for improvements in the manufacture of salt.—Sealed 24th December—6 months for inrolment.

Alexander Mac Rae, of the London Coffee-house, Ludgate-hill, for improvements in machinery for ploughing, harrowing, and other agricultural purposes, to be worked by steam or other power.—Sealed 24th December—6 months for inrolment.

Thomas Hardeman Clarke, of Birmingham, cabinet maker, for certain improved fastenings for window sashes, tables, and such like purposes.—Sealed 24th December—6 months for inrolment.

CELESTIAL PHENOMENA, FOR JANUARY, 1840.

D.	H.	M.	
1			Clock before the sun, 3m. 37s.
	—		☽ rises 5h. 29m. M.
	—		☽ passes mer. 9h. 11m. M.
	—		☽ sets 0h. 46m. A.
	19	3	♃'s second satt. will Im.
2	4	8	♄ in conj. with the ☽ diff. of dec. 6. 28. N.
	11	8	☿ in conj. with the ☽ diff of dec. 7. 29. N.
4	9	20	Ecliptic conj. or ● new moon
5			Clock before the sun, 5m. 29s.
	—		☽ rises 9h. 4m. M.
	—		☽ passes mer. 0h. 39m. A.
	—		☽ sets 4h. 20m. A.
	9	9	☿ in conj. with Pallas, diff. of dec. 24. 46. S
6	16	49	♂ in conj. with the ☽ diff. of dec. 1. 3. N.
8	8	20	☿ greatest elong 23. 19 W.
	10	17	♀ greatest Hel. Lat. N.
	11	28	♂ in Perihelion
	16	41	♃'s third satt. will im.
	18	51	♃'s third satt. will em.
9	2	17	Her: in conj. with the ☽ diff. of dec. 1. 27. S.
	20	41	☿ in conj. with Ceres, diff. of dec. 1. 2. N.
10			Clock before the sun, 7m. 39s.
	—		☽ rises 10h. 29m. M.
	—		☽ passes mer. 4h. 35m. A.
	—		☽ sets 10h. 59m. A.
11			Juno in Perihelion
	—		Occul δ Piscium im. 3h. 18m. em. 4h. 28m.
	19	57	☽ in □ or first quarter.
13			Occul ε in Arietis im. 15h. 7m. em. 15h. 56m.
15			Clock before the sun, 9m. 34s.
	—		☽ rises 0h. 8m. A.
	—		☽ passes mer. 9h. 2m. A.
	—		☽ sets 4h. 45m. M.
	20		☽ in Perigee.
	10		Vesta in conj. with ♃ diff of dec. 5. 55. N.
	12		Juno in □ with the sun
16			Occul C in Tauri im 7h. 9m. em 7h. 42m.
17			Occul A in Geminorum im. 18h. 2m. em. 18h. 41m.
17			Mercury R. A. 18h. 20m. dec. 23. 2. S.
	—		Venus R. A. 16h. 44m. dec. 19. 41. S.
	—		Mars R. A. 21h. 35m. dec. 15. 27. S.
	—		Vesta R. A. 14h. 55m. dec. 9. 36. S.
	—		Juno R. A. 1h. 54m. dec. 2. 45. S.
	—		Pallas R. A. 17h. 41m. dec. 4. 13. N.
	—		Ceres R. A. 17h. 55m. dec. 23. 17. S.
	—		Jupiter R. A. 14h. 53m. dec. 15. 26. S.
	—		Saturn R. A. 17h. 6m. dec. 21. 27. S.
	—		Georg. R. A. 23h. 1m. dec. 7. 4. S.
	—		Mercury passes mer. 22h. 37m.
	—		Venus passes mer. 21h. 1m.
	—		Mars passes mer. 1h. 52m.
	—		Jupiter passes mer. 19h. 6m.
	—		Saturn passes mer. 21h. 19m.
18	12	33	Ecliptic oppo. or ○ full moon
	17	35	♃'s first satt. will im.
19	11	29	☿ in the descending node
	15	42	♃'s second satt. will em.
20			Clock before the sun, 11m. 13s.
	—		☽ rises 6h. 28m. A.
	—		☽ passes mer. 1h. 9m. M.
	—		☽ sets 8h. 55m. M.
22	2	8	♀ in conj. with ♄ diff. of dec. 0. 57. N.
23	5	50	Ceres in the descending node
25			Clock before the sun, 12m. 33s.
	—		☽ rises Morn.
	—		☽ passes mer. 4h. 52m. M.
	—		☽ sets 9h. 56m. M.
26	1	34	☽ in □ or last quarter
	15	59	♃'s second satt. will im.
	18	15	♃'s second satt. will em.
27	3	25	♃ in conj. with the ☽ diff. of dec. 6. 21. N.
	15		☽ in Apogee.
29	14	52	☿ in Aphelion.
	17	31	♄ in conj. with the ☽ diff. of dec. 6. 33. N.
30			Clock before the sun, 13m. 33s.
	—		☽ rises 5h. 30m. M.
	—		☽ passes mer. 8h. 45m. M.
	—		☽ sets 11h. 58m. M.
	10	28	♀ in conj. with the ☽ diff. of dec. 6. 50. N.

J. LEWTHWAITE, Rotherhithe.

THE

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CONJOINED SERIES.

No. XCVI.

Recent Patents.

To Alexandre Happey, *of Basing-lane, in the city of London, gentleman, for an invention of a new composition applicable to paving roads, streets, terraces, and other places; which improvements are also applicable to the different purposes of building; and also in the apparatus for making the said composition.*—[Sealed 25th April, 1837.]

This invention consists of a new composition applicable to paving roads, streets, terraces, and other places; which improvements are also applicable to the different purposes of building; and also in the apparatus for making the said composition "in such manner as to me the said Alexandre Happey, my executors, administrators, and assigns, or any of them in my or their discretion should seem meet." In which said letters patent is contained a proviso for making void the same if I should not describe and ascertain the nature of the said invention, and in what manner the same is to be performed, and cause the same to be inrolled within six calendar months after the date of the said in part recited letters patent, as in and by the same reference being thereunto had, will more fully and at large appear.

Now therefore know ye that, in compliance with the said proviso, I, the said Alexandre Happey, do declare the nature of the said invention to consist, firstly, in a mixture of certain well-known matters and substances, whereby a new composition, which I call "elastic bituminous mastic," is produced, applicable to the formation of roads for horses and carriages, and of pavements for public footpaths, or for halls, yards, stables, and terraces, and like purposes; and also in forming the roofs and coverings of buildings; and secondly, in an apparatus for making and preparing the said "elastic bituminous mastic." And in further compliance with the said proviso, I, the said Alexandre Happey, do now proceed to describe the manner in which the said invention is to be carried into effect and applied by the following description thereof, that is to say:—

Firstly, as regards the said new composition or "elastic bituminous mastic," all descriptions of tar may be employed, as resinous vegetable tar, natural mineral tar, or the tar from coal, such as is produced or separated from coal during the manufacture of coal gas for illumination, or for the production of coke, or by any other means, and which tar I shall distinguish by the name of coal tar; but when coal tar is employed, it must be used in the state known as "purified coal tar," that is to say, having had the volatile essential oil and ammonia, which are mixed with it upon its first production from coal, separated from it by the ordinary process of distillation. It is also necessary to state, that when "purified coal tar" is used, a certain proportion of vegetable or of thin fluid mineral tar must be employed with it, as will be hereafter more particularly specified.

The other ingredients employed in making and preparing this new composition or "elastic bituminous mastic" are mineral, earthy, and stony matters or substances, and a quantity of fibrous or filamentous, vegetable, or animal substances, which, as well as the proportions in which they are to be respectively used, will be hereafter more particularly set forth. I may add, that as purified coal tar is much cheaper than vegetable and mineral tar, it is of course desirable to employ it in order to save expence.

As the "elastic bituminous mastic" is applicable to various purposes, the several matters of which it is composed are employed in different proportions as may best serve the object in view in its application, I shall therefore proceed to describe the several species of the "elastic bituminous mastic," which I recommend, together with the particular subjects for which they are best adapted respectively.

For streets and roads, for the passage of horses and carriages, I use two sorts of the "elastic bituminous mastic." The one which is used in the first layer or stratum, as will be hereafter more particularly described, and which is the less flexible of the two sorts, is composed of twenty parts in bulk of purified coal tar, with four parts of vegetable or mineral tar, or twenty-four parts of vegetable or mineral tar; if no coal tar be used, twenty parts of chalk or clayey earth, in fine powder, six parts of quick-lime, in powder, twenty parts of fine sand, four parts of fibrous or filamentous, vegetable, or animal matters, such as sawdust, hemp, chopped straw or hay, moss, the refuse of wool, horse or cow-hair, cartilage, &c., and lastly, four parts of coarse sand;—this species of the mastic I shall distinguish No. 1.

The species of the mastic employed in the second instance in roads, &c., for horses and carriages, and which is more flexible and elastic than No. 1, is composed of twenty parts of coal tar with ten parts of vegetable or mineral tar, or thirty parts of vegetable or mineral tar where no coal tar is employed, twenty-one parts of chalk or clayey earth, in powder, twenty parts of fine sand, eight parts of fibrous or filamentous, vegetable, or animal matters, and four parts of coarse sand;—this species of the mastic I designate as No. 2.

For pavements in the interior of houses, cellars, warehouses, garden walks, and in general for foot pavements, and places where horses and carriages do not pass, the mastic is compounded with the same proportions as No. 1, except that eight parts of coarse sand are used instead of four;—this species of the mastic I distinguish as No. 3.

For docks, basins, and impermeable and water-tight walls, the mastic, hereinbefore described as No. 2, is to be employed, using twenty-five parts of fine sand instead of twenty parts, and entirely omitting the coarse sand;—this species of the mastic I distinguish as No. 4.

For roofings of houses and buildings, the "elastic bituminous mastic" is to be composed of three parts of coal tar, with one part and a half of vegetable or mineral tar, or four parts and a half of vegetable or mineral tar where no coal tar is used, two parts of chalk or clayey earth, in powder, two parts of fine sand, and two parts of fibrous or filamentous, vegetable, or animal matters;—this species of the mastic I designate as No. 5.

For roads formed with pebbles, flints, stones, or the waste or refuse of hard bricks, broken with uniformity, and for roads designated as macadamized roads, the "elastic bituminous mastic," No. 2, is employed, with the addition of a thin bed or layer of from one-twelfth, but not exceeding one-sixth part of an inch in thickness of very infusible iron ore, well separated from the earthy matter adhering to it, and previously broken into very small pieces, which is to be spread over the bed of mastic, No. 2, and mixed with it, as hereinafter particularly mentioned;—this bed or layer of iron ore thus forms an ingredient of this species of "elastic bituminous mastic," and which I designate as No. 6.

In every species of the "elastic bituminous mastic," it is to be observed, that it is absolutely essential that a proportion of fibrous or filamentous, vegetable, or animal matters, such as has been above mentioned or alluded to, shall be included. The object of the introduction of these fibrous or filamentous, vegetable, or animal matters, is to increase the adhesive nature of the whole mass of the composition in all its parts, and to counteract the effects which might arise from the brittleness of bituminous matter when in a solid state. The proportions of the different ingredients will necessarily vary in some degree according to circumstances, for some discretion and judgment must be exercised, regard being had to the original consistence of the tar to be employed, and to the quality of the other matters of which the mastic is to be composed, as well as with respect to the particular place or locality where it is to be applied.

I now proceed to describe the mode of preparing the "elastic bituminous mastic" in the apparatus, which forms the second part of the said invention, and which will be hereafter particularly described, and the same course or order of introducing the ingredients is applicable to all the several species of the mastic above described. The tar to be employed is first introduced into the cauldron, but where coal tar is used, only one-half of the designated quantity of vegetable or mineral tar to be mixed with it is to be at first introduced; it is then heated so as to render it very fluid, but it is not to be permitted to boil; the prescribed quantity of chalk or clayey earth, in powder, is then introduced, and stirred about in the tar, and the heat is continued until it shall have acquired such a consistence as, if permitted to cool, would resemble the consistence of soft bees' wax, which a little experience will readily teach; the remainder of the vegetable or mineral tar, where coal tar is employed, is now to be introduced into the cauldron, and stirred well about, after which the prescribed proportion of fine sand is added, and a stronger heat is then applied until the composition shall have acquired a consistence adapted to the use to which the mastic is to be applied. In the cases of the species No. 1 and No. 3,—this is the proper period for adding the designated quantity of quick-lime, in powder.

The next addition to be made to any of the species of the "elastic bituminous mastic," in a course of preparation, is the quantity of fibrous or filamentous, vegetable, or animal matters. The time for their introduction should be, as nearly as possible, at the moment the mastic is about to be employed. The introduction of these matters is to be effected by mixing them in the composition, and stirring up the whole mass well from the bottom and throughout, so as well and thoroughly to disperse them through every part. The quantity or proportion of these vegetable or animal matters is always, as is the case with the other ingredients, a subject of some discretion; but great care should always be taken that their amount should not in any perceptible degree affect or alter the thickness or consistence of the composition; and care should also be taken that the heat of the composition, at the moment of introducing and mixing with it these vegetable or animal matters, shall not be so great or intense as to incur the risk of destroying them, as it is essential that their vegetable and animal properties should be preserved. Lastly, the course sand, where it is to form a part of the mastic, as in No. 1, No. 2, and No. 3, is to be added at the moment of its application to the place where it is to be employed.

In cases where it is intended to whiten a coating or covering of the mastic, in order to lessen or counteract the effects of the rays of the sun, to which No. 2 and No. 5 are applicable, a thirtieth part at the most, or a fiftieth part at the least of tallow, as compared with the entire mass, is to be mixed with the mastic; after which, chalk, whiting, or other fine powder, is to be added, as more particularly directed hereafter.

And secondly, as regards the apparatus for making and preparing the said "elastic bituminous mastic," I now proceed to describe the said apparatus, having reference in this part of the specification to the drawings hereunto annexed, in all the figures in which the same letters designate the same parts of the apparatus, and which drawings are to be considered and taken to form part of this specification, that is to say:—

Plate XV., fig. 1, represents a sectional elevation of the furnace and cauldron, taken in the line a, b, in figs. 3 and 4, so as to show the interior thereof, with the pipe and other apparatus for disposing of the vapours which arise from the tar, &c. in the cauldron when subjected to heat. Fig. 2, represents a front view of the furnace and cauldron, to show more plainly the situation of the last-mentioned pipe and apparatus for disposing of the vapours of the tar, &c. Fig. 3, represents an elevation of the back or hinder part of the entire apparatus, and exhibits the position and arrangement of the inclined plane hereafter mentioned, and the register for regulating the issue of the "elastic bituminous mastic" from the cauldron. Fig. 4, is a plan of the cauldron, looking down from above, and shews the projection of the inclined plane from the back of the cauldron, a side view of which is shewn in fig. 1, annexed to the drawings; and forming part thereof is a reference to the letters, or several figures, specifying the several parts of the apparatus by name.

This apparatus might, if constructed sufficiently small and portable, be placed on a carriage and taken to the place where the mastic is to be used; in which case, the bottom of the cauldron should be constructed in a sloping or inclined direction to facilitate the emptying of the cauldron by the contrivance behind, as shewn in the above figures; but in case where the apparatus is fixed or built in masonry, as shewn in the sectional elevation, fig. 5, and plan view, fig. 6, the contrivance behind for emptying it might be entirely omitted, and the mode of spreading the mastic, by means hereafter specified, (under figs. 7, 8, 9, 10, and 11,) resorted to instead.

The cauldron I, I, used in compounding and preparing the "elastic bituminous mastic," may be either of wrought or cast iron; but when made of wrought iron, in order to moderate the heat and prevent it from soon burning out, a moveable false bottom Q, also of wrought iron, should be interposed between the cauldron and the furnace F, which may be removed and replaced at pleasure. This false bottom should have half an inch distance between it and the bottom of the cauldron, and which interval is to be completely filled with fine sand.

In order to prevent any inconvenience either to the workmen employed in preparing the mastic, or to neighbouring dwellings, from the vapours which may exhale from the cauldron, there is placed over the cauldron a hood or conical covering K, constructed of wrought iron or masonry, from the upper part of which a pipe D, D, of a size proportioned to the capacity of the cauldron, is carried on the outside of the cauldron and furnace downwards, having an opening on one side G, by which a pipe E, is conducted under the furnace bars L, of the fire, whereby the vapours above mentioned are conveyed through the fire by the draught, and are consumed and decomposed. As in these vapours there is an admixture of essential oil, which is subject to inflame, and might, while in a state of vapour, occasion explosion, a piece of wire gauze is placed over the exit at G, of the pipe E, which communicates under the furnace bars, and the pipe D, D, from the hood, is continued down lower, where a small vessel H, receives the essential oil when condensed.

The mastic, when ready for use, may be spread upon the road by means of the arrangement in the rear of the cauldron, the whole apparatus being moved, as required, along the road upon the carriage on which it is fixed or suspended, the wheels of which carriage O, O, should have broad fellies. The mode of dispersing or spreading the mastic is effected by means of the opening in the rear for the whole breadth of the cauldron, which is covered with a thin plate of wrought iron R, which forms the register of the apparatus, and is intended to regulate the issue of the mastic. The register is made to slide up and down, being attached to the pieces M, M, in which there are grooves moving upon the pins N, N. The raising or lowering of the register R, may be effected by a screw or wheel attached to that part of the apparatus. When the register R, is opened the mastic will flow out of the cauldron upon the iron plate V, V, which extends diagonally downwards from the back of the apparatus in the nature of an inclined plane, supported underneath by the iron rods S, S, and reaches to within a short distance of the ground. For the purpose of introducing the materials into the cauldron, the top may be made moveable, or if constructed with masonry, with a door as at U, fig. 4; and at the commencement of the process of preparing the mastic, when the furnace is first lighted, the cover of the cauldron is to be left a little open, and the ash-pit C, is kept close shut, which causes the fire to draw down through the pipe D, D, the air on the surface of the tar, and thereby establishes a current from the top of the cauldron through D, D, and E, whereby the vapours arising from the tar, &c. will be disposed of as above mentioned,

Having thus described both parts of the invention, I now proceed to explain and describe the manner in which the several species of the "elastic bituminous mastic" are to be applied to the several purposes to which they are adapted, and the previous or preliminary preparation of the ground intended to receive them.

Generally the ground upon which it is intended to spread the "elastic bituminous mastic" ought first to be as strongly compressed and consolidated as possible, which may be effected by passing over it a very strong and heavy iron roller, or by ramming, or by any other known method. If the ground be naturally soft and humid, it will be advisable to spread on it a layer of coarse sand, or small or fine gravel, which is to be compressed by rolling, and is then to be sprinkled sufficiently with a thin mortar or cream of lime, of the description calculated to harden under water, to give consistency and firmness to the ground. Upon this layer thus formed, or on the ground thus compressed and consolidated, a complete and perfect pavement is to be laid, consisting of stones wrought into parallelopipeds, of as regular a form as practicable, and of the same size and dimensions, and which may be of the usual description for paving carriage roads, and for which purpose all descriptions of stones in common use,—granite, lava, rocks, and in short all kinds of stones of sufficient hardness to resist the pressure of heavy weights; and also hard artificial stones or substances, such as bricks or terra cotta may be employed. These pavements of hard, natural, or other stones, of a durable quality and capable of resistance, may be of less size and thickness than the stones ordinarily used in pavements, because the "elastic bituminous mastic" increases the capability for resistance.

These stones or other substances employed for the above pavement are to be placed longitudinally side by side on their edges, so as to present their longitudinal thickness to the surface, and as close together as possible. If hard bricks or artificial stones are employed, they should be disposed in the same manner, that is, longitudinally edgeways. When stones and materials less hard and capable of resistance are used, and when the road is not to be subjected to the slipping of horses' feet, as in the case of roads intended for the passage of steam or locomotive carriages, stones of much larger dimension than on common roads may be used, and an "elastic bituminous mastic" pavement, similar to a flag pavement, is formed for the passage of the wheels.

To render the adherence of the stones of the pavement (above described) to each other more certain, the upper half of the circumference of each stone, of the breadth of two inches at least, is daubed or painted over with a coat of very fluid tar or bitumen, and by means of a brush this coat of tar or bitumen may be applied at pleasure round the paving stones, either before or after they are put into their places. All dirt, mud, and dust, which may be found at this period of the process, should be carefully cleared from the ground. When the pavement has been thus carefully prepared, the stones lying as close to each other as possible, the joints or intervals which are not filled up, ought, at the time of placing the stones, to be well filled with sand, to which is to be added a cream of lime to give more solidity; and this may be effected by proceeding with both the operations of covering the upper circumference of the stones with tar, and embedding the lower part in sand and cream of lime as the pavement proceeds, for the sand and cream of lime are not intended to reach higher between the stones than the commencement of the coating of tar. If it be desired to give it greater power to resist extraordinary weights, instead of the sand and cream of lime the "elastic bitumen mastic," No. 1, should be substituted. When a portion of the pavement has been thus disposed, the principal cavities or interstices which remain in the upper part of the joints between the stones, are to be filled with small flat or smooth stones, in the form of wedges, which are to be driven with a hammer or mallet, so as to enter and sink a little below the upper surface of the pavement; then the "elastic bituminous mastic," No. 2, is to be poured very hot into all the joints and cavities which remain, to fill them to the level of the rest of the pavement, and so as that the upper surface of the pavement shall be as level as its nature will permit; it is then to be covered with small or fine gravel, which is made to sink into the mastic by being struck with wooden mallets or rammers, and upon that is to be immediately strewed a thin layer of sand. The upper surface of the pavement may remain bare, or may be covered with a very thin coating of tar, and immediately with sand, to render it impervious to water.

The operations above described are intended to apply to roads which are to be entirely newly paved, but the same system may be applied to the pavement of roads and streets already formed, by using the materials of which those roads and streets have been formed, after they shall have been properly and conveniently repaired. In such cases it will be sufficient to scrape the joints or intervals between the stones with iron hooks, and to rub or brush them strongly before the daubing or painting of the superior portion of the circumference with the coat of fluid tar takes place; after which the operations, hereinbefore directed in the case of entirely new pavements, are to be exactly followed.

Roads formed of unhewn or unwrought stones or round pebbles, may receive the "elastic bituminous mastic" in the same manner as roads having regular and rectangular pavement, but they require greater care and attention, because it is difficult to cause the mastic to adhere strongly to rounded or smooth surfaces, and because the joints or intervals between the stones being very wide and open, the action of the wheels of carriages and the feet of horses can more easily disturb and break up the mastic. To avoid this inconvenience the most regular of the joints or intervals between the stones are, in the first place, to be filled up with stones, in the form of wedges, forced in with a mallet as already mentioned; and then small stakes of hard wood are in like manner forced into the joints or intervals, which are irregular and open, or extensive; and old iron nails or nails of cast iron are driven into the narrowest joints or intervals, by which means the adherence of the "bituminous mastic" will be completely secured. The operations of completing the work will then proceed exactly in the same manner as have been already described.

When bricks are to be employed in the formation of roads, basins, docks, walls, and other impermeable or water-tight constructions, they should be steeped while very hot, and upon being removed from the oven or clamp, in very hot vegetable or mineral tar, which has been some time exposed to heat in a cauldron.

When about to be used for basins, docks, walls, water-tight or impermeable constructions, or foot-pavements, the sides of the bricks should be daubed or painted over with the "elastic bituminous mastic," No. 1; and when about to be employed for paving roads or streets, with the "elastic bituminous mastic," No. 2, care being always taken, as in other pavements, to thoroughly cover the surface of the joints or intervals with gravel or sand, which is made to enter and sink by a mallet.

Pebbled or flinty bituminous roads are formed of pebbles, flints, or stones, or the waste or refuse of hard bricks, broken with uniformity, and which include those called Macadamized roads; and which materials are to be immediately covered and united together first with a layer or stratum of the "elastic bituminous mastic," No. 1, and afterwards with a stratum of No. 2 or No. 6. These roads are formed by first spreading over the ground, which should be previously levelled and consolidated, a bed of soft stones or similar materials two inches thick, and over them a bed, of like thickness, of hard stones or other materials of about the size of an egg, and which should be slightly pressed down to make them more solid and regular. Then the stratum of mastic, No. 1, is poured on so as entirely to cover the stones or materials. This application of the mastic may be made by the hand, using large flat ladles of wrought iron, or with a small apparatus made on purpose, of which a drawing and description is given in figs. 7, 8, 9, 10, and 11, which will be hereafter more particularly described.

When the bed of mastic, No. 1, is spread, it is immediately covered with hard stones or materials, broken to about the size of a walnut, which are struck with a rammer in order to make them sink into the mastic; upon this is placed a thin bed or layer of the mastic, No. 2, which, as before mentioned, is the most flexible and elastic; and when the additional expense will not form an objection, a thin bed or layer of very infusible iron ore, well cleaned and separated from the earthy matter adhering to it when found, and previously broken into very small pieces, should be spread over the bed of mastic, No. 2, of the thickness of from one-twelfth, but not exceeding one-sixth of an inch, which is then to be forced by pressure into the mastic, No. 2, thereby forming the mastic, No. 6, hereinbefore mentioned; over this is to be spread coarse gravel or stones, broken to about the size of a bean; and lastly, fine gravel or coarse sand is to be spread over the surface, and the road compressed and consolidated together with a heavy iron roller.

Roads of any other description may, in like manner, be formed upon the principles and directions above specified by the intervention of the "elastic bituminous mastic," which do not require to be specifically pointed out.

When it is intended to employ the "elastic bituminous mastic" in situations where it will be exposed to motion or vibration, as for example,—in the formation of ceilings and roofs; the first step necessary is to apply upon the surface a coat of vegetable or mineral tar with a brush, and to spread over that coat of tar pieces or strips of common or coarse linen, or cotton cloth, or strong paper, in as long continuous pieces as possible, and then the cloth or paper is to be slightly wetted so that it may be stretched flat and without wrinkles, and be protected from being scorched or burned by the application of the hot "elastic bituminous mastic." These pieces or strips of cloth or paper are to be placed along, that is to say, from top of the roof to the bottom, and are to be fastened by means of strings of thread tape as well at the edges as in the middle of these pieces of cloth or paper, and at the distance of not more than a foot from each other, and the strings of thread tape are secured by nails at five or six inches distance from each other.

The "elastic bituminous mastic," No. 5, above described, is then spread over the cloth or paper with a brush, over which is strewed hot fine sand by means of a sieve, or some such contrivance.

When it is wished to whiten a coating of the mastic, as in the case of roofings and other surfaces, a quantity of tallow is to be added to the "elastic bituminous mastic," No. 5, in the proportion hereinbefore mentioned; and immediately after the coating of mastic has been spread, and while very hot, hot chalk or whiting, in fine powder, is to be sprinkled over, which becomes congealed or fixed with the tallow on being applied, and should be rubbed smooth with the hand. In this operation the tallow becoming melted by the heat of the mastic, and coming to the surface, the chalk or whiting will form with it a light insoluble crust, adhering closely to the mastic, and being white will reflect the rays of the sun, and cause a considerable reduction of temperature, and, continuing unchanged, serves also to protect the mastic from the influence of the atmosphere. Gutters may be formed at the edges of the roof to carry off the rain, &c., by extending the pieces or strips of cloth or paper, covered with the mastic, and doubling them to the extent of an inch under the eaves of the building.

For foot-ways and the ground floors of warehouses, or the floors of halls, cellars, and houses on the ground, the "elastic bituminous mastic," No. 3, is employed. In these cases the ground is prepared by being rammed, or beaten, or rolled strongly, upon which a bed of gravel and small stones are placed; it is then again to be rammed, or beaten, or rolled, and a covering or layer of fine dry sand is to be added; then upon the sand a very thin layer or bed of the coarser parts of flax, or hemp, or the waste or ravellings of old rope is to be strewed. The "elastic bituminous mastic," No. 3, is then poured, as if in a mould, to the thickness, varying from one-third of an inch to an inch over a certain extent of the ground so prepared, and the like ground is repeated until the whole extent is covered with the mastic, and each coat of mastic, as it is placed on the ground, is then sprinkled with fine gravel, by means of a sieve, or such like contrivance.

This gravel may be in its natural state, or blackened, or coloured at pleasure, according to the expence which is intended to be incurred; and it is made to penetrate the mastic by beating and pressing it with small wooden hand-beaters, like those used by plumbers, but flatter.

The foot pavements may be constructed plain and level, or they may have upon their surface shallow channels, which, by crossing each other, form compartments, and present the appearance of a regular flag pavement. These channels would receive the fluid mud which would be occasioned by rain, and conduct it to the gutters or kennels, so as to render the foot-ways, thus intersected, more clean and convenient than plain foot-paths.

These channels may be formed by ribbed iron frames, which are indented by pressure into the coating of the mastic after it is spread upon the ground, and while it still remains hot.

The apparatus represented in the drawings, figs. 7, 8, 9, 10, and 11, consists of a strong barrel with thick iron hoops, supported on a carriage with wheels or cylinders, very broad, with a contrivance at the back somewhat analagous to that already described for spreading or dispersing the mastic, but which is easier of transport than the apparatus in which the mastic is prepared.

The barrel, in order that the mastic may remain sufficiently fluid for use a greater length of time, should be made with an outer covering united to the inner by cross pieces of wood, and the interval between the inner and the outer covering should be filled with sawdust, moss, wool, cow-hair, charcoal in powder, or any other substance which will occasion a retention of the heat.

Fig. 7 and fig. 8, are sections of the barrel, shewing the outer covering of the inner barrel, the cross pieces of wood, and the matters inserted between; fig. 8, also contains a section of the outlet for the mastic behind; fig. 9, shews a transverse elevation of the barrel, with the outlet for the mastic, but without the contrivance for spreading it; fig. 10, is a longitudinal sectional representation of the barrel and apparatus for spreading the mastic complete; and fig. 11, is a transverse view of the back of the barrel, with the apparatus for spreading it.

It will be seen that as the mastic issues from the outlet E, which is regulated by the screw above, it passes into a sort of hopper F, down an apron or inclined plane K, and is discharged from K, upon the road.

The apparatus at the back of the barrel for spreading or dispersing the bitumen, consists of a carriage, figs. 10, and 11, B, B, on wheels or cylinders; A, A, which are very broad and cross pieces; C, and D, D, being much higher, so as to tilt the barrel, and cause it to be completely emptied. The carriage is drawn forward by the hook I. The place of issue for the mastic is behind the barrel at E, which is placed behind a wooden hopper F, F, fixed on the grinders B, B, in which hopper there is an opening G, G, the extent of which is regulated by a moveable board H, H.

The barrel being upon its carriage and taken to the road, which is to receive the mastic, it is dragged by ropes fastened to the hook I. The wheels or cylinders in revolving, smooth and level the road; then a man, mounted on the after part of the barrel or carriage, opens the tube E, the mastic spreads itself into the hopper F, F, and issuing from the opening G, spreads itself in a sheet first upon the apron K, K, whose purpose is to make it regular in its progress, and from thence upon the road. Two men who follow the apparatus equalize the coat of mastic with hot trowels.

This last operation may also be done mechanically, by means of a large and thin plate of iron, figs. 10, and 11; S, S, fixed on a cross piece of wood T, T, which is supported by two iron shanks or flat rods U, U, U, which are attached to its sides, and also on the sides of the hopper F, F, by means of studs M, M, placed in the grooves V, V, in which the studs move, whereby the iron plate S, S, is made to rise and fall at will. This plate S, S, receives an elastic pressure by means of two springs X, X, connected with a screw Y, which are placed in the head of the cheek Z, Z, which regulates the pressure at pleasure.

And whereas, as regards the first part of the said invention, I do not claim the use or employment of any of the materials separately, but I claim the composition, as above described, when fully prepared and ready for use; the fibrous or filamentous, vegetable, and animal matters or substances, above-mentioned, being essential to the composition of every modification of the elastic bituminous mastic.

And whereas, as regards the second part of the said invention, I do not claim any part or portion of the apparatus singly for making and preparing the said composition, but I claim the arrangement and combination of the several parts and portions of the said apparatus when put together. —[*Inrolled in the Rolls Chapel Office, October* 1837.]

To THOMAS HALL, *of Leeds, in the county of York, brass founder, for his invention of a new combination or arrangement of parts forming an improved furnace for consuming smoke and economising fuel, applicable to steam engine boilers and other furnaces.*— [Sealed 21st February, 1839.]

THIS invention of an improved furnace consists in a peculiar arrangement of two or more fire-places under one boiler, with the flues and dampers necessary for their effective operation, whereby the smoke and gases arising from the combustion of a fresh supply of fuel becomes consumed by passing over the surface of a glowing fire in the fire-place contiguous. This is effected by dividing the furnace longitudinally into two or more parts, in order to form two or more distinct fire-places, which are to be supplied with fresh fuel alternately, allowing that in the adjoining fire-place, over which the fresh smoke is to be directed, to have become completely red.

The direction of the smoke and gases is regulated by dampers placed at the ends of the furnaces, in order that the communication with the flue may be cut off from such fire-place while the fresh fuel is introducing, and the smoke emitted is driven over the red-hot fuel of the next fire-place, through a lateral opening, by which means the smoke becomes consumed.

Plate XV., fig. 1, represents a transverse section, taken through about the middle of one of the improved furnaces; and fig. 2, is a longitudinal section. In both these figures similar letters refer to corresponding parts.

The furnace in these figures is divided into two compartments A, and B, by the longitudinal partition *a*; placed in the middle between the fire-places; *b*, *c*, are the dampers, which are to be slidden up and down in grooves *d*, *d*, *d*, *d*, for the purpose of directing the smoke. Toothed racks *e*, *e*, are fastened to the lower ends of the sliding dampers, as seen in fig. 1. A toothed wheel *f*, takes into gear with the racks *e*, *e*, which is actuated by a pinion *g*, fixed on the end of the shaft *h*. This pinion is made to revolve by turning the winch handle *i*, at its reverse end.

In fig. 1, the damper *c*, is supposed to be up and the damper *b*, down. The fire B, is represented as having just received a fresh supply of fuel, and the fire A, burning brightly, and giving off little or no smoke. As the damper *c*, belonging to the fire-place B, prevents the smoke from going forward directly into the flue, the smoke and vapour will of course be compelled to pass through the lateral opening in the partition *a*, and over the red-hot fuel in the fire-place A, (as seen in the drawing) which smoke and vapour, in its passage, will necessarily become consumed or put into a state of combustion before it reaches the main flue surrounding the boiler.

When the fuel in B, has burnt up brightly and ceased to give off smoke, then the damper belonging to it should be lowered, and the damper of the fire-place A, raised, which are done simultaneously by means of the wheel and pinion before mentioned, taking into the racks affixed to the dampers. The fire-place A, may then be supplied with fresh fuel, the smoke and vapour from which will pass laterally through the aperture in the partition *a*, over the red-hot fire in B, and will be consumed as in the former instance.

In conclusion,—I desire it to be understood that I do not intend to confine myself precisely to the arrangement of the parts as shewn in the drawing, being aware that they may be varied without deviating from the principle or main feature of my invention; but I claim as my improvement in the arrangement of the parts of furnaces for steam boilers and other purposes, the division of the furnace into two or more fire-places, by means of a longitudinal partition or partitions, having a lateral aperture or apertures communicating from one fire-place to the next fire-place adjoining, with moveable dampers at the ends of the respective fire-places for occasionally stopping the flues, in order that the dense volume of smoke and combustible vapour evolved at every fresh supply of fuel, may be conducted into the adjoining fire-place, where, by passing over the ignited red-hot fuel, it may become burnt and consumed.—[*Inrolled in the Rolls Chapel Office, August,* 1839.]

Specification drawn by Messrs. Newton and Berry.

To WILLIAM OVERTON, *of No.* 19, *Shovel-alley, in the parish of St. George in the East, and county of Middlesex, gentleman, for certain improvements in machinery or apparatus for making ships' bread or biscuits.*—[Sealed 3rd April, 1839.]

THESE improvements in machinery or apparatus for making ships' bread or biscuits consist, firstly, in a machine for kneading the dough; and secondly, in a machine or machinery for rolling out the dough to its required thickness, and cutting or stamping it into the forms of biscuits.

In Plate XVI., fig. 1, is an elevation of the kneading machine; fig. 2, a section taken longitudinally through the same.

When flour and water has been properly mixed together in the usual way of making dough, I introduce the dough into the hopper *a, a, a,* for the purpose of kneading it between the two fluted rollers *b, b,* which are placed under the lower aperture of the hopper. The journals of these rollers *b, b,* turn on bearings in the side frames, and upon their front ends are fixed a pair of toothed wheels *c, c,* of similar diameters, taking into each other. On the axle of one of the rollers is fixed a toothed wheel *d,* which takes into a pinion *e,* fixed on a shaft mounted in the frame of the machine. To this shaft is attached a winch or handle *f,* and by this winch the machine is put in operation.

Manual power being applied to the winch *f,* the pinion *e,* causes the wheel *d,* to revolve, and with it the wheel *c,* and roller *b,* on the axle of which it is fixed; and the teeth of the two wheels *c,* being in gear with each other, they are by these means both made to revolve simultaneously, and with them the two fluted rollers *b, b.*

Thus, by the rotary motion of the rollers, the dough is gradually drawn down through the hopper, and kneaded in its passage between the fluted rollers, and deposited in the box below. But as the complete process of kneading may not have been effected by once passing the dough between the rollers, it may be removed from the box *g,* and again introduced into the hopper, and passed between the rollers again and again several times until the kneading is complete.

Before the last time of passing the dough between the rollers, I introduce the shoot *h,* for the purpose of bringing the dough out in a flat sheet, and conducting it in that form away to the second machine, where it is to be rolled out to its proper thickness and cut into biscuits. The shoot *h*, may, if desired, be permanently fixed in the box *g*, and then the dough may pass over on to a suitable receptacle as it proceeds from the rollers.

Fig. 3, represents an elevation of the machine for rolling and cutting the dough into biscuits; fig. 4, is a section of the same taken longitudinally through the machine; and fig. 5, is a horizontal view of the machine, looking down upon its upper surface *a*, *a*, *a*, on the side frames *b*, *c*, *d*; *c*, a horizontal bed, inclined at the end, upon which the sheet of dough is to be spread out at *b*, passed under the rollers at *c*, and discharged at *d*.

A pair of cylindrical rollers *e*, *e*, protruded through the horizontal part of the bed *c*, operate as bed-rollers to conduct the sheet of dough forward. A similar pair of rollers are the pressers, by which the sheet of dough is formed to the required thickness.

A cylindrical roller *g*, has thin ribs of metal placed round its periphery, in hexagonal shapes, for the purpose of cutting or marking out the sheet of dough into forms suited for biscuits; and another cylindrical roller *h*, is furnished with spikes or pins, set round its periphery for the purpose of pricking or piercing the required holes in the biscuits as they pass under it.

The manner in which I put these rollers in simultaneous rotary motion, will be perceived by the arrangement of wheels attached to the axles of the several rollers, (represented in figs. 3 and 5,) and the pinions by which they are connected, which are driven by a winch on the axle of a pinion at *k*.

The dough, as before said, is to be spread out upon the flat bed at *b*, and pushed forward so as to come within the bite of the first pair of rollers *e, f.* On rotary motion being then given to the rollers, the sheet of dough will be conducted forward between the second pair, and thereby brought to the desired thickness for being cut into biscuits. The dough thus prepared will then pass on upon the bed *c*, under the roller *g*, and by so passing will be cut or marked out into hexagonal or other forms, corresponding with the arrangement of the cutting edges fixed round the periphery of the cylinder. The sheet of dough so marked out will proceed onward and pass under the roller *h*, where it will be pricked or pierced by the spikes set round its periphery; and in order that the sheet of dough may not adhere to the roller *h*, a scraper (shewn detached at fig. 4,) is placed behind it at *i*, having openings for the spikes to pass through as the roller revolves, which effectually removes the sheet of dough, and allows it to proceed down the inclined plain of the bed at *d*, from whence it is taken in portions by a peel, and introduced into the oven.

As it may be necessary to make batches of biscuits of different thicknesses, a provision is made for raising and lowering the pressing rollers *f, f*, so that the space for the passage of the dough between them and the bed-rollers *e, e*, may be adjusted as shall, under circumstances, be required; this is effected by nuts and screws, shewn at *l, l, l*, in fig. 3, which are connected to sliding plummer blocks, carrying the journals or axles of the rollers *f, f, g*, and *h*.

A modification of the last described machine is shewn in longitudinal section at figs. 7 and 8, in which only the pressing rollers *e, e*, and *f, f*, are adapted. The sheet of dough so prepared and delivered on to the inclined part of the bed, may then be cut out into biscuits and pricked by hand.

In these figures, however, I have introduced an apparatus for cutting and pricking by means of a screw press.—A wooden frame *m, m,* carries a cutter for separating the dough into hexagonal pieces. The form of this cutter is shewn at fig. 9, which represents its face. It is made of thin ribs, standing out like those upon the roller *g,* before described, but in this case is flat. The wooden frame *m,* is attached to a screw *n,* mounted in a stretcher or bracket. By turning this screw *n,* the frame with the cutter will be brought down upon the sheet of dough, being upon the inclined plane, and will cut or mark out the hexagonal forms of the biscuits, and at the same time the biscuits will be pricked by the points inserted into the under part of the frame. In order to prevent the portions of the dough so cut and pricked from rising and adhering to the points and cutters, a series of moveable plates are made to act within the hexagonal frame of cutters, which plates, as the frame descends, are allowed to recede or be pressed back by the surface of the sheet of dough, while the cutters and prickers penetrate it; but when the frame is raised, these plates and the rails to which they are attached, fall again by their own gravity and force the dough out of the cutters, leaving it flat upon the inclined plane as before.

The portion of dough thus operated upon may now be drawn off the inclined plane, and by means of a peel introduced into the oven as before.

Lastly, I wish it to be understood that I no not intend to claim as new all the parts of the machinery exhibited in the drawing, but as respects the kneading machine I claim the employment of indented rollers placed below the hoppers for squeezing and kneading the dough as it is passed between them; and as respects the machinery for rolling out the dough and cutting it into biscuits, I claim the arrangements of the several parts as shewn in the drawings, and particularly the construction of the cutting and pricking apparatus,—there exhibited.—[*Inrolled in the Rolls Chapel Office, October*, 1839.]

Specification drawn by Messrs. Newton and Berry.

To William Nash, *of Budge-row, in the city of London, merchant, for certain improvements in the construction of bridges, viaducts, roofs, and other parts of buildings; being a communication from abroad.*—[Sealed 21st February, 1339.]

These improvements in the construction of bridges, viaducts, roofs, and other parts of buildings, consist in a peculiar form, arrangement, and mode of connecting bars of iron or beams of wood, placed diagonally at acute angles, and braced together by other bars or beams placed in horizontal positions, and parallel to each other; which combination or structure affords a degree of stability from its firm tension, that is not found in any of the ordinary constructions of bridges or roofs composed of similar weights of material, either on the suspension or tension principles.

Plate XVI., fig. 1, represents a single bar A, shewn in perspective, a combination of several of which, elevated in diagonal positions at acute angles, and connected by horizontal parallel bars B, B, and C, as shewn at fig. 2, constitutes the side frame-work of one of my improved bridges or other similar structures; fig. 3, represents one of the pairs of the top or bottom horizontal parallel bars B, detached as they would appear on the top side.

The forms and substances of the bars being fully shewn by the three first figures of the drawing, I will proceed to describe the mode of constructing the joints.

It will be perceived that the ends *a*, *a*, of the elevated bars A, are peculiarly formed, so that when the bars are placed in diagonal positions at acute angles, their ends may fit accurately in the notches or recesses of the top and bottom horizontal bars B, B, the latter of which are brought together and connected by socketed joints, as shewn at *b*, *b*, in the detached fig. 4, and the whole is made fast by bolts *c*, *c*. The middle horizontal bar C, is connected to the elevated bars A, A, by differently formed notches and recesses, as shewn at *d*, *d*, and *e*, *e*, fig. 1.

Fig. 5, is an elevation, and fig. 6, a plan of one of the end standards D, to which the horizontal bars B, B, and C, and the two extreme elevated bars A, are affixed, in order to finish the side-frame of the structure. These end standards bear perpendicularly upon the piers or masonry, which are placed for supporting the whole frame-work of the bridge or other erection; therefore, no abutments, or buttresses, or tension ties, beyond the ends, are necessary to resist the longitudinal force, as the whole pressure or weight of the erection is by the bracing of the bars, concentrated in the ends, bearing perpendicularly upon the piers.

Fig. 7, is an elevation of a bridge constructed on this improved principle; and fig. 8, is a plan of the under part of the roadway of the same. The two side-frames, when formed by the combination of bars, as above described, are erected upon the piers E, E, as shewn in fig. 7, and are then braced together by diagonal transverse bars *f*, *f*, *f*, placed horizontally and at acute angles, the ends of which, bearing upon the middle horizontal bars C, and with their longitudinal bracing bars *g*, *g*, support the road-way or flooring of the bridge.

In this construction of bridges no perceptible lateral vibration is perceived, as the perfect tension of the whole admits of no other movement, but that arising from the mere flexion of the material of which it is made.—[*Inrolled in the Rolls Chapel Office, August*, 1839.]

Specification drawn by Messrs. Newton and Berry.

To James Nasmyth, *of Patricroft, near Manchester, in the county of Lancaster, engineer, for his invention of certain improvements applicable to the bearings or journals of locomotive or other steam engines, which improvements are also applicable to the bearings or journals of machinery in general.*—[Sealed 9th April, 1839.]

These improvements, applicable to the bearings or journals of locomotive and other steam engines, which improvements are also applicable to the bearings or journals of machinery in general, consist in a peculiar mode of encircling or surrounding such bearings or journals, with collars or rings of case-hardened iron, or hardened steel, in place of the ordinary brasses or steps, as hitherto commonly employed in similar situations.

The peculiar feature of novelty of this invention, is the forming of such case-hardened iron, or hardened steel collars or rings in *two pieces*, and fastening them in such a manner, by means of a key or pin, that they are prevented from turning round upon the surface of the bearing or journal which they encircle. I have attached to these presents a drawing representing the application of my improvement to the crank or connecting rod, and to the stay or axle-bearing of a locomotive steam engine, which will sufficiently illustrate its applicability in all situations in machinery, where bearings or journals are necessary.

Fig. 1, plate XVI., represents the end of a connecting rod with the crank-bearing or journal, in section; fig. 2, is a front or side elevation of the connecting rod or crank. Fig. 3, is an elevation of the axle or stay-bearing, with the bearing or journal of the axle or shaft in section; and fig. 4, is a horizontal or plan view of the same. In fig. 1, *a*, represents the section of the crank-bearing, and fig. 2, *b*, *b*, *b*, the crank: around this bearing or journal, I place a collar of hardened steel, or case-hardened iron, *c*, *d*, which collar 1 am enabled to place in that situation, by having it cut or divided into two or more parts, *(two being the number I prefer)*, and in the direction shewn by the oblique line *e*, *f*, in fig. 2, or *e*, *f*, in fig. 1; and by means of a metallic key or pin *g*, sunk half its depth into the surface of the bearing *a*, and half into a corresponding recess, sunk into the ends of the collar *c*, *d*, I not only cause the semicircular collars to encircle the bearing *a*, but by means of the key *g*, they are entirely prevented from turning round upon the surface of the bearing *a*; and in this manner, I am enabled to surround the crank-bearing with an entire surface of hardened steel, or case-hardened iron.

I place or fix the connecting rod *h*, in contact with, and around this hardened collar, in the ordinary manner, namely, by having the strap *i*, *i*, and the butt end *k*, *k*, keyed or fastened together by means of two gibs and collar *l*, *m*, *n*, which wedge the strap *i*, *i*, firmly against the dovetailed shoulder *o*, *o*; and further, by making the interior or rubbing surface of the strap *i*, of case-hardened iron, or hardened steel, and also in the same manner by making the semi-circular butt end *k*, of the connecting rod of case-hardened iron, or hardened steel.

I am in this manner enabled to form the two rubbing or moving surfaces of the bearing and connecting rod of *hard* materials, and thereby confer upon this most important part of the steam engine, a degree of durability never hitherto obtained; besides which, in consequence of such durability, the necessity of tightening up the collars in the usual manner, where brasses are employed, is entirely dispensed with;—after the collar *m*, is drawn up tight, it may be permanently fixed by a rivet or screw, as may be found convenient. In order to prevent any chance of the points *p*, *p*, of the butt end *k*, tripping into the joint or cut *e*, *f*, I cut the collar *c*, *d*, at two opposite sides *in the diagonal direction*, as seen at *e*, *f*, in fig. 2, so that the points *p*, *p*, can never enter the joint when turning round the collars *c*, *d*; and in order to facilitate the placing of the semicircular collars round the bearing *a*, I flatten each alternate extremity, as may be seen at *e*, *f*, in fig. 1.

In like manner I encircle or surround all other bearings or journals used in machinery in general, where truth and durability is required, with these, or similar case-hardened iron, or hardened steel collars, substituting in place of brasses, case-hardened iron, or hardened steel blocks or steps, as shewn at *q*, *q*, in figs. 3, and 4, which there represent their application to another part of the locomotive engine called a stay-bearing.

Having thus particularly ascertained and described my improvements, applicable to the bearings or journals of locomotive steam engines, and to the machinery in general, I desire it to be particularly understood, that I claim as my invention, and which is secured to me by virtue of the said in part recited letters patent, the peculiar mode of encircling or surrounding crank, and all other such, or similar bearings or journals, with collars of case-hardened iron, or hardened steel, namely,—by placing or fixing such collars around bearings or journals in two parts or pieces, and preventing the same from turning round, otherwise, than along with the shaft or bearing on which they are fixed by means of the aforesaid key; and in the manner, and for the purposes shewn in the accompanying drawings, and also herein particularly set forth.—[*Inrolled in the Rolls Chapel Office, August* 1839.]

Specification drawn by Messrs. Newton and Berry.

To LOT FAULKNER, *of Cheadle, in the county of Chester, calico printer, for his invention of certain improvements in the mode of working pumps and valves, and which improvements are also applicable to fire-engines and other similar apparatus.*—[Sealed 11th April, 1839.]

THESE improvements in the mode of working pumps and valves, and which improvements are also applicable to fire-engines and other similar apparatus, consist, firstly, in the peculiar application and arrangement of certain segments of leather to pump buckets, valves, plungers, or pistons, in order to constitute a perfectly tight, elastic, and durable packing; and secondly, in the application of such or similar pump buckets, valves, plungers, or pistons, to a certain arrangement and construction of apparatus, in order to employ the same as a fire-extinguishing engine, ship's pump, garden engine, or any other similar apparatus, wherein such pump buckets, valves, plungers, or pistons, may be used with advantage.

But, in order that these improvements may be more particularly explained, I have attached to these presents a sheet of drawings representing various views of the same, and also their application to the working of pumps or any similar apparatus.

Description of the drawings:—Plate XVI., fig. 1, represents an elevation of a pump bucket; fig. 2, a section taken through the middle of the same; fig. 3, a plan or top view; and fig. 4, a section taken through the bucket at the dotted line in fig. 2.

a, a, is the piston rod or plunger; *b, b,* the bucket; *c, c, c, c,* several segments of leather, pinned or otherwise fastened together, to form a deep ring, and left somewhat short of meeting at their extremities, in order that they may be elastic and spring outwards tightly against the sides of the pump barrel; *d, d, d, d,* are other similar segments of leather, forming another ring or segment; *d,* is a slight spring of brass or other metal, to assist the elasticity of the leather segments; *e, e,* is a tube or lining of leather capable of being slightly compressed in order to allow of the segments *c,* and *d,* being held or pressed closely together by the cross-head *f, f,* and upper ring *g, g*; the valve or water-way is shewn at *h, h.*

The application of these improvements to fire-engines and other similar apparatus, is shewn in the longitudinal and transverse sectional figs. 5, and 6, wherein *a, a,* represents the engine framing or water cistern; *b, b, b,* three pump-barrels worked in connection with each other, by means of the three-throw crank-shafts *c, c, c,* the guide or parallel links *d, d, d,* and the pump-rods *e, e, e,* To the lower extremity of these pumps, rods, or plungers, the improved mode of working the pumps is shewn; *f, f,* being the peculiar construction of leather packing as above described; *g,* is the entrance or suction hose pipe; *h, h,* the water-way to the pump barrel; and *i, i,* the discharge pipe to the running hose or branch end.

I would here remark, that in the application of these improvements to the pumping of acids, or other corrosive liquids or waters, I employ *alternate segments* of brass and leather, in the composition of the packing-rings or segments *c*, and *d*, and also substitute a lining of thin brass, divided into four parts, instead of the leather tube *e*, *e*.

Having now fully described the nature of my said invention, and the manner in which the same is to be performed, I desire it to be understood, that I claim as my invention, (and which is secured to me by virtue of the above recited letters patent,) the peculiar construction and arrangement of the pump bucket-valve, plunger, or piston, in working pumps and valves; and also its application and use in the manner, and for the purposes represented in the accompanying drawings, and herein particularly set forth.—[*Inrolled in the Rolls Chapel Office, October*, 1839.]

Specification drawn by Messrs. Newton and Berry.

To Jeremiah Grime, *of Bury, in the county of Lancaster, engraver, for his invention of certain improvements in manufacturing wheels, which are applicable to locomotive engines, tenders, and carriages, and to running wheels for other useful purposes; also in the apparatus for constructing the same.*—[Sealed 21st February, 1838.]

These improvements in manufacturing wheels, which are applicable to locomotive engines, their tenders and carriages, and which are principally designed to run upon railways, consist, firstly, in the particular arrangement and disposition of such parts as are necessary to form the wheel, which is to be constructed entirely of wrought iron, and afterwards, by means of suitable machinery or apparatus, the whole is to be compressed and welded into a solid wheel; and during such latter process, the felloe, with its flanch, and the spokes, and nave or boss, will all be perfectly united, by the working or welding of the metal, that no joint, imperfection, or weakness, will be perceptible. But as the wheel will be thus rendered into one mass of wrought iron, and the flanch formed upon the same piece or bar as the felloe, the necessity of a separate tyre-iron is dispensed with, and consequently, the outer rim or periphery of the wheel is more durable, as it is impossible that the flanch or tyre-iron can work off, or become loose, it being all welded into one mass.

In order that these improvements may be clearly understood, I have shewn in the drawings several figures which represent views of my improved wheels in a complete state, with some explanatory figures in detail, and also other figures, which are modifications in the construction or putting together of the various parts of which such wheels are formed, and the apparatus for performing the various operations.

Plate XVII., fig. 1, is a side view of a plate or disc of iron, about a quarter of an inch in thickness; it will be seen that a piece has been pressed or punched out of this plate as at *a*, which forms the spaces between the spokes or arms of the intended wheel; and when this plate has been equally divided, and similar pieces having been punched out all round, it will be obvious that the parts which are left, will form the spokes or arms of the wheel, and will appear as in fig. 2, which is an entire or face view of the wheel complete. But in order to obtain a proper strength and thickness for a locomotive engine, or carriage wheel, I place as many of these perforated plates of metal side by side, as will be required to constitute the necessary thickness of the wheel, taking care to have the two or three outer plates a little thicker than the rest, and of as much larger diameter as will be requisite to allow for the after formation of the flanch upon its periphery. A few more circular pieces are also to be punched out of ordinary plate iron, and placed in the proper situations to form the projecting boss upon each side of the wheel; it will also be seen that there are small circular holes *b*, *b*, punched or pierced at the extremity of each spoke or arm. When the plates are all put together, a small piece of metal tubing is passed into all these holes, which serves to lock or keep the pile of plates in one position, while they are undergoing an after process, and at the same time, the hole which is left by the tube will serve in a small degree to lighten the wheel. Fig. 3, is an edge view of the two outer plates, and fig. 4, is an edge view of the whole system of plates as put together.

The wheel in this position is now to be placed in a reverberatory or other furnace, (which will be more particularly described hereafter,) and the whole of the plates heated to a welding heat; and by the working of an apparatus in connection with the furnace, (also to be hereafter described), they will be perfectly welded into one solid wheel of wrought iron, with the spokes or arms, nave, felloe, and flanch, all welded into one entire mass. Upon coming from the furnace and the welding apparatus, it will be evident that the complete wheel will appear upon its face, as represented in fig. 2, and upon its edge as in fig. 4. It has now only to be taken to the lathe, to have the outer scale removed from the metal, and the cone and flanch properly turned upon its periphery. Fig. 5, represents an edge view of the whole as finished after turning, and fig. 6, a section taken through the wheel at the dotted line A, B, in fig. 2.

I wish it here to be particularly observed, that in the piling or arranging the system of plates for this description of wheel, I place them so that the grain, "or end of the iron," shall always cross and diverge from the centre of the wheel, and thus present a much more durable surface to the work, and assisting materially to strengthen the whole wheel. This will be readily understood by persons conversant with the subject, and is to be accomplished by always marking or noticing the first hole or space punched out in each plate; and thus, supposing there are twelve plates, and twelve arms in the wheel, I put the ***second*** space on the second plate, immediately over the ***first*** space in the first plate, and the ***third*** space in the third plate also over the ***first*** space in the first plate, and so on successively.

I wish it also to be understood, that if it should be found to be more desirable to save the process of welding, in the above description of wheel, the spaces may be at once punched or pressed out of one solid plate or cake of metal, of the thickness required when finished; but this I do not recommend, as it would require so great a power, and the mass of metal would be so unwieldy to handle,—in fact, it would be altogether a much more expensive wheel if made from one thick plate, and not so well to be depended upon as one made from thin plates, which are easily punched and welded, or the entire pile of plates (or any of them,) may be so arranged that the whole system shall be operated upon at once.

It may also be necessary here to remark, that instead of the plate being turned round in divisions, and punching one space out at a time, the dies may be so constructed, as to punch the whole of the spaces out of the plates or plate at one operation of the punching apparatus, and this plan would also evidently require more power, but in wheels of small diameter, it might be done with advantage.

Although I have above described, with reference to figs. 1, 2, 3, and 4, this process, as applicable to wheels to be used for locomotive purposes upon railways, yet the same construction of wheels will evidently be applicable to running wheels for all descriptions of carriages, and, indeed, for whatever purpose such wheels may be used; and also wheels for machinery in general, having either spur or bevilled teeth, may be advantageously made in a similar manner of wrought iron, where extra durability and strength is required. Another class of wheels also, wholly constructed of wrought iron, are exhibited in the following figures in which the various parts consist of bars of rolled or wrought iron, and are so arranged, that the grain of the iron shall be also placed in radial lines, diverging from the centre of the wheel, so that what is termed "the end of the iron," shall present itself to the rail or road upon which the wheel runs.

This description of wheel is to be constructed in the following manner:—bars of malleable iron are to be rolled either with plain flat surfaces, or with bevilled, dovetailed, circular, or other indentations, as represented in sectional figs. 7, and 8, and these bars are to be divided and cut into short sections or lengths of the same size as the intended thickness or depth of the rim and flanch of the wheel, as in figs. 9, and 10. The required number of arms or spokes must also be prepared as represented in the face view, fig. 11, and the edge view fig. 12, which may be done by dies or swages in the common process of forging, as represented in fig. 13.

The forged arms thus prepared must be now all put together, and the nave thus completly formed, and the small pieces or segments are all to be placed or dovetailed together in the requsite order, to form the outer rim or felloe of the wheel, as shewn in the face view fig. 14; and in the edge view fig. 15, it will be seen that these two figures shew the exact state of the wheel, prior to the welding together of all the parts;—it is then to be put in the furnace and heated, and all welded into one mass as before described with reference to the former wheel. After removing this wheel from the welding apparatus, it will also (when intended to be used upon railways,) require to have the cone and flanch turned out of the solid metal of the felloe, as in the wheel first described, or an ordinary flanch or tyre-iron may be welded into the felloe to save turning the metal from the solid. Fig. 16, represents a face view of this wheel when complete, and fig. 17, a section taken through the middle of the same.

This construction of wheel may also be slightly varied, as represented in the face view fig. 18, and section fig. 19, where it will be seen that the arrangement and construction of the arms and nave are the same, but the felloe and flanch are made of a rolled bar similar to common tyre-iron, and having the arms or spokes welded on to it by being likewise submitted to the before-mentioned apparatus. In order to assist the process of welding, the arms are formed with a lip or projection, as shewn at *a*, *a*, and there is a corresponding recess rolled into the bar iron forming the felloe, so that the end of the arm may spread in the process of welding, and more firmly unite to the felloe than by merely "jumping up" the end of the arms.

Another description of wheel may also be constructed, by having a rolled bar to form the felloe, as represented in section at fig. 20, and in face or side view at fig. 21, where the bar is shewn bent round, having its two ends welded to form the felloe; circular pieces of plate iron, as at *a*, *a*, fig. 22, are then to be punched out and filled up to make the requisite thickness for the nave and longitudinal pieces of the shape of the arm, as at *b*, *b*; fig. 22, must also be punched out of plate iron, and piled in the same furnace as heretofore described, which will thus form a complete wheel, the appearance of which when turned and finished is shewn at fig. 23, and in section at fig. 24. This wheel may be made of a lighter description if required, by making the two other plates on each side of the wheel serve for the arms, and dispensing with all the inner plates, as shewn in the sectional fig. 25.

Another description of wheel formed out of these punched iron plates, and slightly modified from any yet described, is represented at fig. 26, where the outer plates have the spaces between the arms punched out exactly in a similar manner as above described in reference to fig. 1, and the felloe is formed by segments of thin plate iron, being punched into the form shewn at fig. 27, with holes *a*, *a*, punched in them, and circular pieces of thin plate iron are also to be punched out to form the nave as at fig. 28. In putting together or constructing this wheel, I recommend that the two outer punched plates should be placed so that the arms shall exactly intersect the spaces in each plate, and supported or strengthened by diagonal rods or bars *c*, *c*, to keep them apart; the segmental pieces of plate to form the felloe, and the circular pieces of plate to form the nave, must now all be piled between the two outer punched plates *b*, *b*, and small iron pins or studs are to be put into the holes *a*, *a*, to keep the plates in their proper places; and the whole is now to be removed to the furnace and welding apparatus, to be heated and welded into one mass. Fig 29, represents this wheel in section.

Another feature of my improvements in manufacturing wheels, is illustrated in figs. 30 and 31. In these figures it will be seen that the felloe of the wheel is made of solid bar iron, having the flanch formed upon its periphery, and being connected with the nave by a pair or more of helically coiled springs *a*, *a*, one end of each being welded fast to the felloe, and the other end to the nave. It is presumed that a wheel constructed in such a manner, having springs of this peculiar form substituted in the place of the spokes or arms, will be better able to lessen the shock upon the carriage as it passes over any irregularities of the road, than when the springs bear upon the axles of the wheel, and the moving body is capable of being more steadily and firmly attached, by having the springs placed within the wheels instead of upon them; this is more especially applicable to locomotive engine and carriage wheels, as any imperfection in the joints between the rails would thus be more immediately relieved, and little or no concussion felt in the carriages; and as such springs are capable of horizontal action as well as vertical, the motion of the train in running would be hardly perceptible.

The second feature of my improvements in manufacturing wheels, consists in the application of such machinery or apparatus to that purpose, as is represented in fig. 1, which is a side elevation, and fig. 2, a horizontal or plan view of the punching machine, or press for punching the holes out of the plates of metal, to form the spaces between the spokes or arms of the wheel.

This punching machine consists of a framing or bed of cast-iron *a*, *a*, having a lever of the first order *b*, *b*, mounted in suitable bearings at its fulcrum *c*; the cutting tool *d*, is suspended at the shorter end of this lever by the links *d**, *d**; the same end of this lever is provided with one half of a pair of cutting blades or shears *e*, the other half or blade being fixed upon the frame of the press. The power being communicated through the driving pinion *f*, will act upon the spur wheel *g*, and cause the crank pin *h*, which is placed in one of its arms, to revolve; thus, vibrating the connecting rod *i*, and raising the longer arm of the lever, will cause the tool *d*, to descend into the under or female die *k*, and necessarily punch or press a piece out of the plate under operation, as shewn at *l*. It will be perceived that as the shorter end of the lever ascends, the shears will come into action, and pare or cut the edges of the plate, as shewn at *m.*

In order that the spaces to be punched out of the plates may be accurate in their position, I first divide the plate upon the circle in which the small holes are made at the extremity of each arm, and by aid of the dies *n*, *n*, adjusted to the lever, and acted upon by the projection *o*, upon the under side of the lever *b*, these small holes are punched out. In taking the plate to that end of the punching machine where the cutting tool *d*, and die *k*, are situated, the two small pins or studs *p*, *p*, are to be put into two of the small holes in the plate, which will act as a holdfast or guide, thus securing the plate in its position, and preventing any lateral shifting of the plate during the descent of the cutting tool *d*. It will be evident that this punching machine only varies from those in ordinary use, for punching boiler plates, in its peculiar application, and that any fly or stamping press may be similarly adapted to the purpose, and also that the cutting tools may be varied to suit any form of space that may be required. Figs. 3, 4, and 5, are representations of the cutters *d*, and *k*, detached.

Fig. 6, is a section taken transversely through the middle of the apparatus, and fig 7, is a front elevation of the same; *a*, *a*, *a*, *a*, is the furnace, having fire doors *b*, *b*, before and behind, the one in front being raised to shew the interior. This furnace is provided with a chimney and damper *c*, similarly to a common reverberating furnace, for the purpose of confining or regulating the heat; it is also provided with a circular stage or platform *d*, *d*, composed of iron and fire-bricks, and mounted on the central shaft *e*. Upon this stage the wheels are to be laid, (or rather the parts above described of which the wheels are to be composed,) and made to revolve slowly by means of the bevil wheels *f*, *f*, and driving shaft *g*, for the purpose of exposing every part equally to the action of the heat. After it has been ascertained that the wheel in the furnace has become of a welding heat, it may be rammed or "puddled," by means of a vertical rammer or any suitable tool, being introduced through the conical hole or aperture *h*, above, for the purpose of performing a partial welding or closing of the various parts; another suitable tool may be introduced through horizontal apertures in the sides of the furnace, which by opening and closing suddenly, similar in action to ordinary forceps or pincers, may thus be brought to act upon the felloe of the wheel, and at opposite points, so that the arms of the wheel may be more readily welded to the felloe, as the wheel revolves upon the stage *d*, *d*. When the wheel has thus been partially welded, and is at a sufficient degree of heat to be completed, it is to be slidden down the guides or rails *i*, *i*, into the mould or bed *k*, as seen in fig. 7;—the top weight or "tup" *l*, is then to be allowed suddenly to drop upon the heated mass, by releasing the end of the cord or chain *m*, and thus to be continually raised and suddenly lowered until a sufficient closing of the parts has been effected, and the welding process found to be completed.

It will be seen that the weight or "tup" *l*, is slung or suspended from the cord *m*, by links *n*, *n*, and is guided in its perpendicular course by slides or friction rollers, *o*, *o*, running up and down the pillars or framings *p*, *p*. The rack *q*, and pinions *r*, *r*, are for the purpose of raising the centre pin *s*, into the nave of the wheel, in order to secure its correct position in the bed *k*. It will be obvious that should it be found more desirable to complete the welding operation, prior to exposing the metal to the atmosphere, it may be as readily accomplished by introducing the "tup" or weight within the walls of the furnace, and raising or lowering it through an aperture in the top. In the event of the flanch and outer periphery of the wheel wearing off, or becoming imperfect by constant use, it will be perceived by the apparatus above provided, a common flanch and tyre-iron may be very readily welded upon any old wheel, and thus be firmly united into one mass, instead of being merely heated and shrunk, or rivetted on as usual.

Having now described every particular of my improvements, I consider it necessary to recapitulate each peculiar feature of novelty which I claim as my invention; but, firstly, I desire it to be understood, that I claim the constructing, placing, and putting together of such particular parts as I have above referred to, in order to constitute a wheel, and the perfecting or welding of them into one entire form, as represented in the various figures;—and secondly, the apparatus or machinery for effecting the same, as drawn and described, or any other means similarly constructed, having the same object in view, and in whatever manner the *power* of welding is *applied.*—[*Inrolled in the Rolls Chapel Office, August*, 1838.]

Specification drawn by Messrs. Newton and Berry.

To WILLIAM WOODLEY, *of Observatory House, Stoke Newington, captain in the navy, for improvements in propelling vessels and carriages, and other machinery.* —[Sealed July 13th, 1839.]

THIS invention is divided into three parts, consisting of three different methods of propelling vessels. The first arrangement of machinery for effecting this object, consists in adapting the common duck's-foot paddle to a vertical shaft, which is put in motion by any suitable moving power.

Two vertical shafts are used, one on each side of the vessel, and in about the same situation as the ordinary paddle wheel.—Two or more paddles may be adapted to each shaft. The advantages derivable from this arrangement are not pointed out by the inventor, and they do not appear to us to be very obvious.

The second part of the invention consists in making a number of holes through the paddles of the ordinary wheel, in order to allow the water to run through, and thus preventing the paddle from lifting so much water when emerging, as this construction of wheel generally does.

The third head consists in adapting a wind-mill for setting in motion the former or any other arrangement of propellers.—[*Inrolled in the Inrolment Office, January,* 1840.]

To Sir William Burnett, Knight, *Commander of the Royal Hanoverian Guelphic Order, of Somerset-house, in the county of Middlesex, for his invention of improvements in preserving wood and other vegetable matters from decay.*—[Sealed July 26th, 1838.]

This invention consists in destroying the tendency of certain vegetable substances to decay, by submitting them to the action of chloride of zinc.

In preparing wood, canvas, cordage, sail-cloth, hemp, flax, and other vegetable matter, or articles made thereof, I provide a tank or other vessel of wood, or other suitable material; I then fill it about two-thirds full of chloride of zinc, dissolved in cold water, in the proportion of one pound of chloride of zinc to five gallons of water,—this I allow to remain for 10 or 12 hours; when the solution is ready, I then place the material which is to be prepared in the solution, keeping it completely covered by the liquid.

If wood or timber is to be prepared, I allow it to remain in the solution from 10 to 21 days, according to its size and thickness,—that is to say, if the timber be of the thickness of from 8 to 13 inches and upwards, I leave it immersed in the solution for 21 days; if from 4 to 8 inches thick, for 14 days; and if less than 4 inches thick, for 10 days. When the wood or timber has been so immersed, I take it out and place it in a situation, sheltered from the weather, until it becomes perfectly dry.

In preparing canvas and cloth, I keep them in the solution for 48 hours, and then dry them under cover; and in this manner other vegetable materials of thin texture may be prepared.

In the preparation of rope or cordage, above the thickness of 2 inches, I steep the hemp or yarns, of which the same is to be formed, in the solution for 48 hours, and cordage or rope of 2 inches or less, I steep in the solution for 72 hours. In all cases, if tar is to be employed, the yarns forming the cordage should be placed in the solution for 48 hours, and allowed to dry before undergoing the tarring process.

In ship-building, and in building or repairing houses, besides preparing the timber to be used therein, as above described, I find it desirable to use a paint made by grinding impure oxide of zinc (lapis calaminaris) with oil or other suitable vehicle. This paint I recommend to be applied, at the time the materials are brought into contact, to the faying parts of all scarfs, and on the joists and faying parts wherever else two pieces of timber are brought into contact, and also on the under-sides of the flats of all magazine platforms, and all other platforms below the orlops of ships of the line, and lower decks of frigates, and below the upper decks of sloops and smaller vessels.

In houses I recommend the paint, made as before stated, for the inside of skirting and wainscoating, of ground floors, and upon every part of the timber materials below the external surface of ground floors.

And I claim, as my improvements in preserving wood or other vegetable materials from decay, the use of the solution, above described, in the manner herein set forth.—[*Inrolled in the Inrolment Office, January,* 1839.]

To SAMUEL SANDERSON HALL, *of the Circus, Minories, in the city of London, for improvements in preserving certain vegetable substances from decay, being a communication.*—[Sealed 3rd August, 1838.]

THE claim set forth by the patentee, is for preserving wood and other vegetable substances from decay, by means of a solution of creosote, or essence of coal tar, dissolved in water.—[*Inrolled in the Inrolment Office, February,* 1839.

To JOSEPH PONS, *of Union-crescent, New Kent-road, in the county of Surrey, gentleman, for an improved process of hardening wood and iron, and rendering wood repulsive of vermin and proof against dry-rot.*—[Sealed 22nd June, 1839,]

THIS improvement consists in the employment of a certain chemical solution in which the wood is to be steeped for a certain time, or the iron is to be dipped when in a heated state.

The chemical solution is described as formed by combining one hundred pounds of sulphate of iron, or of iron filings, with twenty-five pounds of nitric acid,—into which is to be introduced other solutions, viz: twenty-five pounds of alum, fourteen pounds of saltpetre, and five pounds of prussiate of potash. Each of these being separately dissolved in warm water, are to be mixed with the acid solution above described.

A wooden vat or tank is to be employed for holding this chemical solution, which should be kept at a temperature of about 5° Reaumer's thermometer. In this the wood to be hardened should remain immersed for a certain space of time, according to its substance. For pieces of wood from three to five inches in thickness, steeping for three or four days will be sufficient.

Hardening cast-iron, is effected by dipping it in the same chemical solution. The iron is to be heated to a blood-red heat, and then immersed in the liquor for a few minutes.

Wrought iron must be differently treated.—A paste is to be made by mixing five gallons of size with fourteen pounds of saltpetre and five pounds of prussiate. With this paste the iron is to be coated in a cold state, and after having been heated to a blood-red, the iron is to be immersed in the chemical solution for about three minutes.

The patentee says he claims the above described processes for hardening wood and iron; but observes that "beneficial results may be obtained by dispensing with the saltpetre and potash."— [*Inrolled in the Inrolment Office, December*, 1839.]

To JOHN PETRIE, *of Rochdale, in the county of Lancaster, mechanist and engineer, for his invention of certain improvements in steam engines.*—[Sealed 25th July, 1833.]

THESE improvements consist merely in heating the water before it is introduced into the boiler, by passing eduction steam from the working cylinder into a detached vessel, called a *caloric extractor.* Into this vessel the feed water is conducted by a cock, and the steam allowed to pass in at the same time by another aperture, so as to mix with the water; by which means the patentee proposes to raise its temperature to the boiling point before it is pumped into the boiler.

The claim of invention set out, is placing the caloric extractor between the working cylinder and the condenser of a low pressure engine, and between the working cylinder and the chimney in a high pressure engine, and regulating the supply of water to the caloric extractor, so that it shall never be introduced into the boiler at a lower temperature than 212° Fahrenheit.—[*Inrolled in the Inrolment Office, January,* 1834.]

To JAMES WALTON, *of Sowerby-bridge, in the county of York, cloth dresser, for his invention of improvements in machinery for facilitating the operations of raising, dressing, and cropping the pile of woollen and some other fabrics.*—[Sealed 14th January, 1834.]

THE subjects of this patent apply to the machine called a gig mill, in which a rotary barrel or barrels, partially covered with teasles, wire cards, or brushes, act against the surface of woollen cloths, for the purpose of drawing out the ends of the wool, called *raising the pile.* The same contrivances are also described as applicable to machines for cropping or shearing the pile.

As the cloth passes under or over the periphery of the gig barrels in an extended length, it is subject to wrinkle toward the middle of the barrel, and requires to be kept extended by the attendants continually pulling the lists outward. This the patentee proposes to remedy by changing the positions of the drawing and conducting rollers, so that the cloth may pass over or under the gig barrels, not exactly in the direction of a right angle to the axles of the barrel, but in a diagonal or oblique direction. This he effects by mounting the drawing and conducting rollers upon a moveable frame, independent of that which supports the gig barrels, and giving to this frame a vibratory motion, so that the axles of the several rollers which conduct the cloth through, preserving their parallelism to each other, will be brought into such situations as will form angles of considerable obliquity to the axles of the gig barrels. By these means, as the frame and rollers vibrate, the cloth will be drawn first toward one side of the gig barrel and then toward the other side, and be thereby prevented from wrinkling in the middle.

The same contrivance will apply to such shearing machines as work with rotary cutters, and will assist in effecting a very desirable object, viz., cutting or cropping the pile in diagonal directions.

The second feature of the invention, is applying cushions with India rubber surfaces to parts of the periphery of the gig barrel, for the purpose of smoothing and polishing the face of the cloth.*—This is not new.

The third improvement, is the introduction of cushions, filled with water or air, as elastic beds, for pressing the cloth against the gig barrels, or against the cutters in the shearing frame.—This has also been done before, many years ago.

The fourth feature of invention, is the employment of double-threaded screws,—that is, screw shafts having a right-handed thread at one end, and a left-handed thread at the other, so that on being turned they may cause the distances of the rails of a stretching frame, to expand or contract.—This is likewise a very common and well known contrivance for the same purpose.—[*Inrolled in the Inrolment Office, July*, 1834.]

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* India rubber was applied exactly in the same way by Mr. G. D. Harris.—See his Patent of Jan. 15th, 1828, Vol. VI. p. 258, of Second Series of the London Journal of Arts and Sciences.

NOVEL MODE OF CONVEYING A STEAM ENGINE.

It is but a short period that the Steam Engine has been used to convey Post letters on land, and now for the first time a Post letter is made the means of carrying a Steam Engine.

Messrs. Newton and Berry, of the Patent Office, Chancery-lane, London, have this morning received per post, from Messrs. Chadburn Brothers, Sheffield, a perfect working steam engine, constructed on the oscillating cylinder principle, with its fly-wheel, framing, boiler, and fire-place complete; the whole was enclosed in a case wrapped in paper secured with string, and accompanied with a description of its construction and mode of working. The total weight being under four ounces, was charged as eight letters, which sum being *pre-paid* at Sheffield, cost eight-pence postage, and came safe to hand with its fellow penny travellers.

We understand that Messrs. Bailey, of Holborn, received last week, per post, a proof impression of an embossed metal plate, which being under half an ounce, was directed on its surface—*pre-paid* at Birmingham, and delivered as a penny post letter. Query.—How did the post-master put the post-office stamps upon it?

Chancery Lane,
January 29th, 1840.

ON THE
USES OF THE METAL PALLADIUM.

This peculiar metal, discovered by the late Dr. Wollaston, in the year 1803, was, for some years only known to exist in the native Platina, of Colombia. In 1812* it was noticed by Mr. P. N. Johnson, in the coin and small negotiable ingots of gold brought from the Brazils.

The rarity of the metal has hitherto prevented its general use, hence few of its valuable properties have been applied in the arts.

The development by the Imperial Brazilian Mining Association, of the gold region of the province of Minas Geraës, (which is peculiar for the existence of this metal in combination with the gold,) has of late years rendered its introduction more general in lieu of gold or platina, over which for many purposes it has its advantages, viz: it equally resists *sulphuretted hydrogen* and *mineral acids.*

It requires a much greater degree of heat for fusion than gold. Its specific gravity is only about half that of platinum, and as 11½ is to 19 in relation to gold, and therefore it is more economical in use.

Its price is not one-eighth of that of gold, and less than half of that of platinum, calculating equal bulk.

It may without injuring its properties be brought to almost any extent of hardness or softness.

Its chief uses at present are confined to dental surgery, in graduated scales for astronomical, nautical, and other instruments, in springs for various purposes, for lightning points, inoculating lancets, and ornamental works of different descriptions.

It is separated from the gold by solution from nitric acid, and from some other metals by addition of caustic ammonia and hydrochloric acid, which process was discovered by Mr. P. N. Johnson, in 1817, and is preferable, both in economy and purity, to the use of prussiate of mercury.

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* See Philosophical Magazine, vol. 40, page 4.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from p. 320, Vol. XV.)

May 14, 1839.

The President in the Chair.

"A description of the Coffre Dam round the 13 and 14 feet piers of Westminster Bridge." By Frederick Pollock, Lieut. Madras Engineers.

It was the intention of Labelye, the builder of Westminster Bridge, that none of the foundations of the piers should be at a less depth than 5 feet below the surface of the bed of the river, but the effect of the removal of old London Bridge, and of the increase of the average difference between high and low water, had in 1836 lowered the bed near the pier on the eastern side, to within 18 inches of the platform, being 3 feet lower than in 1829; and but for the works done under Mr. Telford's direction by Mr. Swinburne, and those which are now going on under the direction of Mr. Walker and Mr. Burges, the piers would have soon become undermined. Labelye is supposed to have been deterred from attempting to lay the foundations by a coffre dam, from the difficulty of keeping it dry and of reaching the bottom; this is, however, now shewn to be a groundless alarm, as one has been constructed which is so tight that two men can keep it perfectly dry.

The Coffre Dam, the construction of which forms the subject of this communication, is formed round the 13 and 14 feet piers at the west end of the bridge, for the purpose of securing the foundations and repairing the damaged arch stones. Previous to the commencement of the work fender piles were driven 10 feet into the bed of the river, and are 5 or 6 feet higher than Trinity high-water mark; a trench was then dredged in the intended line of the coffre dam to the level of the highest caisson; the first gauge pile was driven on the 14th of July, the first sheeting pile on the 24th, and the water stopped out or the coffre dam completed in the short space of seven months.

The author then details the dimensions of the timbers and the construction of the various parts of the dam as represented in the drawing, accompanying the communication. There are about 40,000 cubic feet of timber in the dam. The mean depth of the mud in the dam, the water being let out, was from 4 to 5 feet; underneath the mud, at about 3 or 4 feet above the caisson, is a stratum of red gravel of an average depth of 15 feet, and below this is clay. The weight of the piers has bent down the caisson as shewn in the drawing, but the timbers are still sound and good. The pressure against the dam, at an average high tide, is 1775 tons.

The President remarked, that there was frequently considerable ambiguity in the use of the terms, *rise of the tide*, and misconception as to the effect of the removal of old London Bridge upon the rise and fall of the tides. The water falls lower by between 3 or 4 feet, that is, by the height of the sill, which was removed, but the difference of level of high-water is very small, not more than a few inches. The old London Bridge caused a sort of weir, varying from 8 to 18 inches, as the water ran up, but depending in a great measure on the quantity of upland water which was coming down; sometimes there was scarcely any difference of level on the two sides of the bridge.

The President presented from Mr. Pryor a specimen of Straw Coke, and Mr. Pryor stated the method of making it to be exceedingly simple, though but few attempts were successful. A mass of straw saturated with water is thrust into the farthest corner of the coke oven, previous to the oven being charged; the damper being kept close the smoke impregnates the straw, and it endures the heat for 48 hours: it is well sprinkled with water immediately on being withdrawn. Mr. Lowe described its production as the effect of smothered or subdued combustion. The carbon becomes deposited on the straw saturated with moisture, and placed at the part of the oven least exposed to oxygen. The difficulty is to account for the oxygen of the atmosphere not combining with it when hot; there must be some means of protecting it from the oxygen of the atmosphere on its being withdrawn, which is to him yet a mystery.

May 28, 1839.

The PRESIDENT in the Chair.

Colonel Pasley stated the result of some experiments which he had made with a diving bell in the Thames and in the Medway. The common rectangular diving bell, suspended from a vessel in a very strong tide, was completely swept under the boat, and in some other cases it swung round half and half, or was twisted considerably out of its proper position. He attached boat-shaped ends, and on descending at the half ebb of a strong flood tide the bell was perfectly steady. He should think a bell fitted in this manner would be exceedingly advantageous for going alongside of wrecks. He should recommend the ends to be moveable, and if the wreck were athwart the tide he should have only one end put on, and bring the bluff end against the vessel. An experienced diver had informed him, that in the current of the Danube, running seven knots an hour, the bell vibrated tremendously. Since this arrangement had occurred to him, he discovered that a similar one had been proposed to the "then Navy Board," about twenty years ago, by Mr. W. S. Smith, who had been employed under Mr. Rennie, but it does not appear to have been tried. Colonel Pasley promised the Institution a more detailed account of his experience on this important subject.

Mr. Parkes stated, that he would take this opportunity of the presence of Mr. Williams to lay before the meeting some specimens of French Peat, which had been alluded to on a previous occasion. One of the specimens was that obtained by allowing the particles to come within the influence of the natural forces to which the atoms are subject. The slutch as dredged up from the bottom of the streams, in a state of great comminution, was put into moulds, and, contracting as it dried, acquired considerable density. This was an instance of density due to gradual drying; the density became doubled by this process. Mr. Parkes presented a specimen of coke from compressed peat; this Mr. Williams would explain, as he had taken up the subject where every one else had left off, and had succeeded in producing density by mechanical means, at a moderate cost, and, by carbonizing the mass, in getting rid of the volatile particles, which are injurious as a fuel; he thus produced an extremely valuable coke.

Another specimen was of the incrustation on the interior of a gas retort; it was a coke of extreme density and of great value for some purposes, but for what was a secret. This deposition accumulates until the interior of the retort is almost filled up, leaving no available space for the charge. The retorts are bought for the sake of this coke, which is a perfect carbon. A thin coating of carbonaceous matter, which would otherwise be carried off in the gas, is deposited in each charge.

Mr. Lowe was not aware of the uses to which this coke could be applied; but it was of extreme disuse to the gas-makers; he believed, however, that it was used to produce an intense heat. It is sometimes stated to be a carburet of iron, but a portion from the centre of the mass shews, on being tested, not the least trace of iron. It arises naturally in the process of gas-making, and the rate of its deposition depends on the temperature; as in those retorts which have a tendency to become too hot the deposition goes on exceedingly fast. There were many curious facts connected with its deposition; that in a horizontal part is stratified in concentric layers. The upper portions will be perfectly sectile and form admirable crayons, that at the lower part will scratch glass; it decreases in density from the bottom; a portion of the sides partakes of both qualities. He suspected, that a large quantity was sold as black lead.

Mr. Williams remarked, that there were two kinds of peat, the one having a density due to impurities; this is useless for all purposes of metallurgy.—But for the purest carbon, the upper surface of the moss must be used, and an artificial density must be communicated to it; it is only in this manner that a dense and pure coke can be obtained. The peat having this artificial density is carbonized, by which all the volatile matter useless in combustion is driven off, ground, and then being mixed with a bituminous matter the operation of nature in the production of various species of coal may be closely imitated.

June 4, 1839.

The President in the Chair.

"On the Dimensions and Performances of the Archimedean Steamer." By George Rennie, F.R.S., &c. &c.

The method of propulsion, by means of a horizontal spiral screw, applied by Mr. Smith in the Archimedes has frequently been attempted, and many authors have expressed opinions upon its applicability. Among others Mr. Tredgold, in his work on the Steam Engine, expresses a favourable opinion of this method of propulsion, on account of the action being completely under water and of the compactness and uniformity of the motion, objecting only to the mode of communicating the motion, and the resistance those parts will offer that are applied for that purpose. He gives also a formula, from which it results, that the larger the diameter, and the less the pitch of the screw, the greater will be the proportion of the effective power on the vessel. The obliquity of its action has been advanced as an objection, whereas the operation is analogous to the action of a screw entering or leaving a block of wood, the less resisting medium yielding in proportion to the comparative resistances offered by the vessel and the propeller respectively.

The dimensions of the large screw were 7 feet in diameter and 8 feet in length, with an area of 38 square feet, after deducting the area of the spindle; consequently, if the resistance of the screw exceeded greatly the resistance of the vessel, very little if any loss of progression would take place. The midship sectional area is about 100 square feet; and since the reduction of the resistance of a well-made vessel, according to the experiments of Colonel Beaufoy, as compared with a flat disc forced through the water, has been found on the average to be about $\frac{1}{17}$, the actual midship section will be $\frac{100}{17} = 5{\cdot}8$, or say, with friction, 6;—the large screw, therefore, having a surface of 38 square feet, or more than 6 times the surface to propel the vessel.

The small screw was 6'-6" diameter, 7'-6" long, 33' area, which by the same reasoning yields $\frac{33}{6} = 5{\cdot}5$ for the ratio of the smaller propeller to the sectional area.

The relative resistances of a circular disc 7 feet in diameter and a globe of similar diameter, at a velocity of 8 miles an hour, are as $4\frac{1}{2}$ to 1. It will not therefore be too low an estimate to take $\frac{1}{30}$ instead of $\frac{1}{17}$ on account of the favourable figure of the vessel. The velocity is ascertained by multiplying the length of the screw into the number of revolutions: the large screw making 80, and the smaller screw 130 to 135, the speed should be 7 and 10 miles respectively. By the log the actual speed was 9 miles; the loss consequently only $\frac{1}{10}$, whereas the average in the common paddle wheel varies from $\frac{3}{10}$ to $\frac{4}{10}$. The greater hold obtained by the propeller will be perceived from the respective depths of immersion, that of the paddle wheel being 18 inches, and that of the screw being 4 feet under the water. The most important application of the propeller is for vessels of war as the machinery is out of range of gun-shot, the engines below the level of the decks, and protected by the coal bunkers on either side, 7 feet in thickness in the Archimedes. In the voyages to

Ramsgate and Portsmouth, the average speed was 9 miles an hour. Mr. Rennie is of opinion, from the results of his own experiments upon the subject, that this method of propelling vessels will ultimately be applied to a considerable extent.

The dimensions of the Archimedes are :

Length of vessel . . .	105	feet.
Breadth	$20\frac{2}{10}$	,,
Depth of hold	$12\frac{1}{10}$	,,
Burthen in tons . . .	230	
Length of engine room . .	38	feet.

The vessel draws 10 feet water, and carries three masts and sails schooner fashion.

Power of engines collectively, 90 horses.

The crank shaft is driven from the connecting rods attached to the piston rods of each cylinder.

Length of stroke 3 feet; 30 strokes per minute.

The speed of the propeller is gained by wheel work, and communicated by a shaft passing beneath the cabin floor and traversing the sternpost of the vessel. The diameter of the screw is now reduced to 6 feet, the length 8 feet, and consists of spiral oblique wrought-iron plates attached by arms to the shaft. The weight of the engines, boilers, and machinery, is about 64 tons.

Upon the first trial of the Archimedes the log indicated 8·5 miles per hour, the vessel readily answered to the helm, and performed the several movements required. Upon the second trial the vessel left the Brunswick Dock at flood tide, and reached Gravesend (21 miles) in $1^{\circ}\ 45'$; upon the following day she arrived at the Nore (22 miles), with the tide, in $1^{\circ}\ 40'$; and subsequently towed a yacht of 50 tons up the Medway, with scarcely diminished speed. From Sheerness the Archimedes reached Ramsgate (45 miles), in $4^{\circ}\ 30'$; the screw was here reduced in diameter, and on leaving the harbour against a heavy tide and N.E. wind, she made five knots, and gave great satisfaction; the sails were set upon rounding the Foreland, and the speed was increased to 9, $9\frac{1}{2}$, and 10 miles per hour, or 14 miles with the tide. Upon her second voyage to Portsmouth the measured mile was performed with the tide in four minutes. The weather was unfavourable, and the wind high; the distance (194 miles) to Portsmouth, occupied 21 hours; her average speed upon the return to London was 9 miles per hour.

June 11, 1839.

JAMES SIMPSON, Esq. in the Chair.

"On Warming and Ventilating Public Buildings and Apartments, with an account of the methods which have been most successfully employed for ensuring a healthy state of the Atmosphere." By Charles Hood, F. R. A. S.

The author first treats of the constitution of the atmosphere; the artificial changes produced in it, and the effect of these changes on animal economy. The researches of chemists shew that in atmospheric air, uncontaminated by respiration or other means, there exists from 21·1 to 20·5 per cent. of oxygen, 78 per cent. of nitrogen, $\frac{1}{10}$ per cent. of carbonic acid, and a small quantity of aqueous vapour. Besides these, there are many foreign matters insensible to chemical tests, but quite sensible to our organs, whereof many being easily decomposible by heat, are resolved into their constituent gases; to this fact it is to be referred the wholesomeness and pleasantness of some artificial systems of heating, or the contrary. The hygrometric condition of the atmosphere is most remarkably affected by change of temperature, as the quantity of vapour in air of 52° F. may be estimated at $\frac{1}{100}$th of the weight of air, at 59° F. at $\frac{1}{80}$th, and at 86° F. at $\frac{1}{40}$th; when then the temperature of the air within the room is considerably above that of the air without, this increased capacity for moisture is productive of effects prejudicial to the health, Moreover, if iron surfaces of too high temperature be present, the vapour may become decomposed, its oxygen combining with the iron, and the hydrogen becoming diffused through the atmosphere. Consequences prejudicial to health from these causes have been repeatedly experienced in rooms heated by a hot air cockle; these effects are not peculiar to the hot air cockle, but will result in a greater or less degree whenever artificial warmth is produced from iron surfaces, the temperature of which much exceeds 212° F. The dryness of the air may in some measure be remedied by moisture, distributed artificially, but the effects from the decomposition of the particles of matter cannot be obviated by any artificial means. The system of Mr. Bernhardt is peculiarly open to these objections, as the pipes nearest the fire must become intensely heated; as also the stoves introduced by Dr. Arnott; since, independent of the difficulty of keeping down the temperature of the metallic surface, carbonic oxide is produced from the coke, and carburetted hydrogen is also formed in the stove. The gas stoves are also open to the same objections; moreover the quantities of water, of nitrogen, and of carbonic acid gas evolved by the combustion of the gas, are extremely deleterious. In the latter case aqueous vapour will be in excess, and consequently the due quantity of perspirable matter is not carried off from the lungs and skin, the injurious effects of which have been clearly established by M. Quetelet in his work on man. The injurious effects of an excess of nitrogen and carbonic acid gas are too well known to require comment.

The author next treats of the best methods of warming buildings in order to secure a healthy state of the atmosphere; and having shewn the disadvantages of applying heat directly to any surfaces, he points out the method of applying it indirectly, as by steam or hot water, contained in iron pipes: the latter is more economical and simple, affords greater permanence and equality, admits of a lower uniform temperature, and any form of heating surface. The temperature of the metallic surface rarely exceeds 180° F. and never reaches 212° F., which is too low to decompose in any appreciable degree the organic matter contained in the air. The only effect is to increase the capacity of the air for moisture, which is readily obviated. The surface which is intended to distribute the heat should be a good conductor and radiator, and the material which presents this combination in its highest degree is iron: the amount of heating surface which will be required depends on the building to be warmed, and on a a great variety of circumstances; but as an approximate rule it may be laid down, that for a church or similar public building the cubic contents of the building divided by 200 will give the number of feet of surface requisite for a temperature of from 55° F. to 58° F. in the coldest weather ordinarily experienced in this country. The form of the heating surface is immaterial as regards the action of the apparatus, but the time requisite to obtain a given temperature, and the permanence of that temperature, depend on the mass of heated matter; the relative times of heating and cooling being inversely as the mass divided by the superficies. A rapid circulation of the water may be obtained by increasing the elevation of the pipes above the boiler, but it is considerably influenced by any alterations in the bore of the pipes. One great advantage in this apparatus is its perfect safety, as the water at some point is always open to the atmosphere, whereas in the system of hermetically sealed pipes, containing steam or hot water under a pressure of from ten to fifty atmospheres, this security can never exist.

3.—The author lastly treats of ventilation; a subject of the greatest importance, independent of the changes already alluded to as produced in the atmosphere by overheated surfaces, since all air respired from the lungs is found to have lost a proportion of its oxygen, and to have acquired a proportion of carbonic acid gas and vapour, and the quantity of air which will require to be changed may be taken as 3½ cubic feet per minute for each person a room contains. The author dwells at considerable length on the physiological effects consequent on these changes, and details several striking instances of the great advantages resulting from improved ventilation, in places which had previously been unhealthy. All ventilation may be placed in one or two classes, the natural or the mechanical; in the former, the excess of temperature of the air is the *primum mobile* of the efflux, and the rapidity of the discharge may be much increased by artificially raising the temperature of the discharging pipe. Ventilation by mechanical means, as by pumps, or by fans rotating with a great velocity, may be most advantageously employed, wherever mechanical power is used for other purposes; the great efficacy of this latter mode is proved most unquestionably by the experience of the manufacturing districts. The former method has recently been tried on a very large scale at the House of Commons, and it is calculated by Dr. Ure that 38 times more fuel is expended in producing the same effect by chimney draughts than by mechanical power. It appears, however, that the natural method of ventilation, by the spontaneous effusion of the heated air, through openings in the ceiling, is the best calculated for ordinary purposes; but that in all extraordinary cases ventilation by some mechanical means is the only economical and efficacious method.

List of Patents

Granted for Scotland between the 23d December, 1839, *and the 20th January*, 1840.

To James Hay, of Belton, in the county of Haddington, Scotland, Captain in the Royal Navy, for an invention of an improved plough, "the Belton Plough."—Sealed 23rd December, 1839—4 months for inrolment.

Christopher Nickels, of the York-road, Lambeth, in the county of Surrey, gentlemen, being a communication from a certain foreigner residing abroad, for an invention of improvements in propelling carriages.—Sealed 24th December, 1839—4 months for inrolment.

Joseph Gibbs, of Kennington, in the county of Surry, engineer, for an invention of an improvement or improvements in the machinery for preparing fibrous substances for spinning, and in the mode of spinning certain fibrous substances.—Sealed 24th December, 1839—4 months for inrolment.

Thomas Edmondson, of Manchester, in the county of Lancaster, clerk, for an invention of certain improvements in printing presses.—Sealed 31st December, 1839—4 months for inrolment.

James Naysmith, of Patricroft, near Manchester, in the county of Lancaster, engineer, for an invention of certain improvements applicable to railway carriages.—Sealed 31st December, 1839—4 months for inrolment.

Thomas Laurente Laing Godard, of Christopher-street, Finsbury-square, in the city of London, merchant, being a communication from a certain foreigner, residing abroad, for improvements in looms for weaving, to be worked by steam or other power.—Sealed 8th January, 1840—4 months for inrolment.

John Bradford Furnival, of Street Ashton, in the county of Warwick, farmer, being a communication from a certain foreigner, residing abroad, for improvements in apparatus or materials, to prevent persons and quadrupeds sinking when in the water.—Sealed 8th January, 1840—4 months for inrolment.

Wilton George Turner, late of Park Villa, Regent's Park, in the county of Middlesex, but now of the Town and County of the Town of Newcastle-upon-Tyne, Doctor of Philosophy,—and Herbert Minton, of Longfield Cottage, in the parish of Stoke-upon-Trent, in the county of Stafford, manufacturer,—for an improved porcelain.—Sealed 9th January, 1840—4 months for inrolment.

Richard Beard, of Egremont-place, New-road, in the county of Middlesex, gentleman, being a communication from a certain foreigner, residing abroad, for improvements in printing calicoes and other fabrics.—Sealed 9th January, 1840—4 months for inrolment.

Alexander Frances Campbell, of Great Plumpstead, in the county of Norfolk, Esq., and Charles White, of the city of Norwich, mechanic, for improvements in ploughs, part of which improvements are applicable to harrows and other agricultural implements.—Sealed 9th January, 1840—4 months for inrolment.

Robert Montgomery, of Johnstone, in the county of Renfrew, in the Kingdom of Scotland, gentleman, for an improvement or improvements in spinning machinery, applicable to mules, jennies, slubbers, and other similar mechanism.—Sealed 9th January, 1840—4 months for inrolment.

William Vickers, of Firs-hill, in the county of York, manufacturer, being a communication from a foreigner, residing abroad, for an improvement in the manufacture of cast steel.—Sealed 10th January, 1840—4 months for inrolment.

Christopher Edward Dampier, of Ware, in the county of Hertford, attorney-at-law, for an improved weighing machine.—Sealed 14th January, 1840.

John Leslie, of Conduit-street, Hanover-square, in the county of Middlesex, tailor, in consequence of a communication from a certain foreigner, residing abroad, for an invention of improvements in measuring the human figure.—Sealed 15th January, 1840.

William Harper, of Cowper's-court, Cornhill, in the city of London, patent stove manufacturer, and Thomas Walker, of Birmingham, in the county of Warwick, for an invention of improvements in stoves and grates, and for preparing metal plates for such stoves, and other purposes.—Sealed 15th January, 1840.

Matthew Heath, of Furnival's-inn, in the city of London, gentleman, in consequence of a communication from a certain foreigner, residing abroad, for improvements in clarifying and filtering water, beer, wine, and other liquors.—Sealed 15th January, 1840.

Thomas Clark and Charles Clark, of Wolverham-place, in the county of Stafford, iron-founders and co-partners, for an invention of improvements in glazing and enamelling cast-iron hollow ware.—Sealed 15th January, 1840.

John Ainslie, Farmer, of Redhaugh, near Dalkirk, for an invention of a machine for a new and improved mode of making or moulding tiles, brick retorts, and such like work from clay.—Sealed 20th January, 1840.

Samuel White, of Charlton Marshall, in the county of Dorset, Esq., for an invention of improvements for preventing persons from being drowned.—Sealed 20th January, 1840.

Arthur Eldred Walker, of Melton-street, Euston-square, engraver, for an invention of improvements in engraving by machinery.—Sealed 20th January, 1840.

New Patents

SEALED IN ENGLAND.

1840.

To John Leo Nicolas, of the parish of Clifton, Bristol, gentleman, for certain improvements in the method of constructing and propelling carriages on railways or common roads, and through fields, for agricultural purposes.—Sealed 1st January—6 months for inrolment.

Samuel Lawson, of Leeds, and John Lawson, of the same place, engineers, and co-partners, for improvements in machinery for spinning, doubling, and twisting flax, wool, silk, cotton, and other fibrous substances, being a communication.—Sealed 2nd January—6 months for inrolment.

Charles Greenway, of Douglas, in the Isle of Man, Esq. for certain improvements in reducing friction in wheels of carriages, which improvements are also applicable to bearings and journals of machinery.—Sealed 3rd January—6 months for inrolment.

John François Victor Fabien, of King William-street, in the city of London, gentleman, for improvements in pumps.—Sealed 7th January—6 months for inrolment.

David Low, of Adams-court, Old Broad-street, merchant, for improvements in machinery for crushing, preparing, and combing flax, hemp, phornium-tenax, and other fibrous substances, being a communication.—Sealed 7th January—6 months for inrolment.

Moses Poole, of Lincoln's-inn, gentleman, for improvements in obtaining power, being a communication.—Sealed 7th January—6 months for inrolment.

John Ridgway, of Cauldon-place, Stafford, china manufacturer, for an improvement in the moulds used in the manufacture of earthenware, porcelain, and other similar substances, whereby such moulds are rendered more durable.—Sealed 11th January—6 months for inrolment.

John Ridgway, of Cauldon-place, Stafford, china manufacturer, and George Wall, the younger, of the same place, gentleman, for certain improvements in the manufacture of china and earthenware, and in the apparatus or machinery applicable thereto.—Sealed 11th January—6 months for inrolment.

John Ridgway, of Cauldon-place, Stafford, china manufacturer, and George Wall, the younger, of the same place, gentleman, for certain improvements in the mode of preparing bats of earthenware and porcelain clays, and of forming or shaping them into articles of earthenware and porcelain, and in the machinery or apparatus applicable thereto.—Sealed 11th January—6 months for inrolment.

Robert Montgomery, of Johnstone, in the county of Renfrew, gentleman, for an improvement or improvements in spinning machinery applicable to mules, jennies, slubbers, and other similar mechanism.—Sealed 11th January—6 months for inrolment.

Christopher Edward Dampier, of Ware, attorney at law, for an improved weighing machine.—Sealed 14th January—4 months for inrolment.

Hezekiah Marshall, of the city of Canterbury, architect, for improvements in window sashes and frames, and in the fastening of window sashes.—Sealed 14th January—6 months for inrolment.

Arthur Eldred Walker, of Melton-street, Euston-square, engineer, for improvements in engraving by machinery.—Sealed 18th January—6 months for inrolment.

Charles Wheatstone, of Conduit-street, Hanover-square, Esq., and William Fothergill Cooke, of Sussex-cottage, Slough, Esq., for improvements in giving signals and sounding alarums at distant places by means of electric currents.—Sealed 21st January—6 months for inrolment.

Samuel Brown, of Finsbury-pavement, civil engineer, for improvements in making casks and other vessels of or from iron and other metals.—Sealed 21st January—6 months for inrolment.

Joseph Rock Cooper, of Birmingham, gun maker, for improvements in fire-arms and in the balls to be used therewith.—Sealed 21st January—6 months for inrolment.

William Stone, of Winsley, gentleman, for improvements in the manufacture of wine.—Sealed 21st January —6 months for inrolment.

James Hall, of Glasgow, upholsterer, for improvements in beds, mattrasses, and apparatus applicable to bedsteads, couches, and chairs.—Sealed 21st January—6 months for inrolment.

Arthur Howe Holdsworth, of Brookhill, Devon, Esq., for improvements in preserving wood from decay.—Sealed 21st January—6 months for inrolment.

William Coltman, of Leicester, frame-smith, and Joseph Wale, of the same place, frame-smith, for improvements in machinery employed in making frame-work, knitting, or stocking fabrics.—Sealed 21st January—6 months for inrolment.

Samuel Wilkes, of Darleston, iron-founder, for improvements in the manufacture of hinges.—Sealed 21st January —6 months for inrolment.

George Wilson, of St. Martin's-court, St. Martin's-lane, for an improved paper-cutting machine.—Sealed 21st January—6 months for inrolment.

Charles Rowley, of Birmingham, stamper and piercer, and Benjamin Wakefield, of Bordesley, machinist, for improved methods of cutting out, stamping, or forming and piercing buttons, shells, and backs for buttons, washers, or other articles, from metal plate, with improved machinery, and tools for those purposes.—Sealed 21st January—6 months for inrolment.

Edward Halliley, of Leeds, cloth manufacturer, for improvements in machinery for raising pile on woollen and other fabrics.—Sealed 21st January—6 months for inrolment.

William Hunt, of the Portugal-hotel, Fleet-street, London, manufacturing chemist, for improvements in the manufacture of potash and soda and their carbonates.—Sealed 21st January,—6 months for inrolment.

Miles Berry, of the Office for Patents, 66, Chancery-lane, patent agent, for certain improvements in the manufacture of prussiate of potash, and prussiate of soda, being a communication.—Sealed 21st January—6 months for inrolment.

Jules Alphonse Simon de Gournay, of Bread-street, London, gentleman, for improvements in the manufacture of horse-shoes, being a communication.—Sealed 22nd January—6 months for inrolment.

George Clarke, of Manchester, manufacturer, for certain improvements in the construction of looms for weaving, —Sealed 23rd January—6 months for inrolment.

Alexander Hett, of Gower-street, Bedford-square, surgeon, for certain improvements in the arrangement and construction of fire-grates or fire-places, applicable to various purposes.—Sealed 23rd January—6 months for inrolment.

James Bingham, of Sheffield, manufacturer, and John Amory Boden, of the same place, manufacturer, for certain improved compositions, which are made to resemble ivory, bone, horn, mother-o'-pearl, and other substances applicable to the manufacture of handles of knives, forks, and razors, piano-forte keys, snuff boxes, and various other articles.—Sealed 25th January—6 months for inrolment.

Thomas Aitken, of Chadderton, Lancaster, manufacturer, for certain improvements in the machinery or apparatus for drawing cotton and other fibrous substances.—Sealed 28th January—6 months for inrolment.

James Smith, jun., and Francis Smith, of Spital-works, near Chesterfield, lace manufacturers, for certain improvements in machinery for the manufacture of figured bobbin net or lace.—Sealed 28th January—6 months for inrolment.

William Pontifex, of Shoe-lane, London, Coppersmith, for an improvement in treating fluids containing colouring matter to obtain the colouring matter therefrom.—Sealed 28th January—6 months for inrolment.

Henry Curzon, of the borough of Kidderminster, machinist, for certain improvements in steam engines.—Sealed 28th January—6 months for inrolment.

John Whitehouse, of West Bromwich, Stafford, ironmaster, for improvements in preparing and rolling iron and other metals or metallic alloys, for the manufacture of certain articles of commerce.—Sealed 28th January—6 months for inrolment.

William Mattershaw Forman, of Sheepshead, Leicester, frame-smith, for certain improvements in stocking frames and machinery used in frame-work knitting.—Sealed 28th January—6 months for inrolment.

CELESTIAL PHENOMENA, FOR FEBRUARY, 1840.

D.	H.	M.	
1			Clock before the sun, 13m. 55s.
	—		☽ rises 7h. 4m. M.
	—		☽ passes mer. 10h. 31m. M.
	—		☽ sets 2h. 3m. A.
	18	25	☿ in conj. with the ☽ diff of dec. 1. 55. N.
	19	35	♀ in conj. with Pallas, diff. of dec. 26. 55. N.
2	18	31	♃'s second satt. will im.
3	1	59	Ecliptic conj. or ● new moon
	15	50	♃'s first satt. will im.
4	18	53	♂ in conj. with the ☽ diff. of dec. 1. 1. S.
5			Clock before the sun, 14m. 19s.
	—		☽ rises 8h. 25m. M.
	—		☽ passes mer. 1h. 48m. A.
	—		☽ sets 7h. 25m. A.
	10	47	Her: in conj. with the ☽ diff. of dec. 1. 41. S.
6	21	11	♃ in □ with the sun
7	6	10	♀ in conj. with Ceres, diff. of dec. 2. 0. S.
10			Clock before the sun, 14m. 34s.
	—		☽ rises 9h. 38m. M.
	—		☽ passes mer. 5h. 54m. A.
	—		☽ sets 1h. 2m. M.
	4	4	☽ in □ or first quarter.
	17	43	♃'s first satt. will im.
11	17		☽ in Perigee.
12			Occul C in Tauri im. 16h. 1m. em 16h. 47m.
13	14	38	♃'s third satt. will im.
13	15	36	Vesta in □ with the sun
14			Occul K in Geminorum im. 9h. 51m. em. 10h. 23m.
15			Clock before the sun, 14m. 30s.
	—		☽ rises 2h. 32m. A.
	—		☽ passes mer. 10h. 56m. A.
	—		☽ sets 6h. 33m. M.
16			☽ eclipsed, invis. at Greenwich
	11	33	♂ in conj. with Her: diff of dec. 0. 9. N.
17			Occul 45 Leonis im. 8h. 45m. em. 9h. 41m.
17	1	53	Ecliptic oppo. or ○ full moon
18			Mercury R. A. 21h. 48m. dec. 15. 26. S.
	—		Venus R. A. 19h. 25m. dec. 21. 5. S.
	—		Mars R.A. 23h. 11m. dec. 6. 8. S.
	—		Vesta R. A. 15h. 42m. dec. 11. 34. S.
	—		Juno R. A. 2h. 46m. dec. 3. 12. N.
	—		Pallas R. A. 18h. 23m. dec. 6. 52. N.
	—		Ceres R. A. 18h. 47m. dec. 23. 49. S.
	—		Jupiter R. A. 15h. 5m. dec. 16. 10. S.
	—		Saturn R. A. 17h. 18m. dec. 21. 39. S.
	—		Georg. R. A. 23h. 7m. dec. 6. 26. S.
	—		Mercury passes mer. noon
	—		Venus passes mer. 21h. 36m.
	—		Mars passes mer. 1h. 21m.
	—		Jupiter passes mer. 17h. 12m.
	—		Saturn passes mer. 19h. 25m.
	—		Georg. passes mer. 1h. 17m.
19	1	47	☿ greatest Hel. Lat. S.
20			Clock before the sun, 14m. 7s.
	—		☽ rises 9h. 14m. A.
	—		☽ passes mer. 2h. 3m. M.
	—		☽ sets 7h. 51m. M.
23	15	30	♃ in conj. with the ☽ diff. of dec. 6. 33. N.
	21	42	☿ in sup. conj. with the sun
24	12		☽ in Apogee.
25			Clock before the sun, 13m. 28s.
	—		☽ rises 2h. 9m. M.
	—		☽ passes mer. 5h. 45m. M.
	—		☽ sets 9h. 14m. M.
	10	51	☽ in □ or last quarter
26	5	9	♄ in conj. with the ☽ diff. of dec. 6. 36. N.
	15	59	♃'s first satt. will im.
27	15	26	♃'s second satt. will im.
	17	42	♃'s second satt. will em.
29	15	1	♀ in conj. with ☽ diff. of dec. 3. 14. N.
		32	☿ in conj. with Her: diff of dec. 0. 39. S.

J LEWTHWAITE, Rotherhithe.

THE

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CONJOINED SERIES.

No. XCVII.

Recent Patents.

To Charles Wye Williams, *of Liverpool, in the county of Lancaster, gentleman, for his invention of certain improvements in boilers and furnaces, designed to economise fuel and heat.*—[Sealed 22nd June, 1839.]

This invention consists, first, in the peculiar construction of certain parts of the furnace called the bridge or flame-bed, and the application of certain flattened or circular perforated tubes connected therewith, by which I effect a quicker and more complete incorporation of the combustible gases issuing from the coal or other fuel in the furnace, with the atmospheric air; and by which incorporation a more perfect combustion of the gases is effected, and the formation of smoke prevented.

Secondly, in a mode of introducing atmospheric air to the bridges and flame-beds of furnaces, and to such tubes, by means of certain other tubes, pipes, or conduits, in a manner unconnected with, and independently of the air in the ash-pit.

Thirdly, in a peculiar mode of introducing the atmospheric air to the solid or carbonaceous part of the fuel on the fire-bars of the furnace, by means of separate perforated tubes placed in the ash-pit, so as to distribute the air equally to the under surface of such bars and fuel, thus preventing too large, or an undue quantity of air being drawn or attracted to any one portion of such bars and fuel, more than to another.

Fourthly, in the application of an artificial blast or current of air for the supply of the before-mentioned tubes or distributors at the bridge and flame-bed, as well as those in the ash-pit, by which the current may be increased or diminished at pleasure, and the combustion of either the gaseous or carbonaceous part of the coals thus accelerated or retarded.

Fifthly, in the application of a moveable bridge, made of fire-clay, by which the fuel on the bars is prevented from interfering with the air distributors in certain cases, and by which also the extent of fire surface and bars may be increased or diminished at will.

And in order to afford the best information for carrying my invention into effect, I give the following description of the process and means I employ:—One mode of applying my invention to land boilers is exhibited in Plate XVIII., at fig. 1, which represents a longitudinal section; fig. 2, the plan; fig. 3, the cross section; and fig. 4, the end view of a boiler. *d, d,* represent a number of flattened tubes, which I call distributors, made of fire-clay, platinum, or other material, sufficient to resist the intense heat of the fire. If made of fire-clay, they may be from about 1 to 1½ inches in thickness, with an interior hollow space of 1 to 2 inches in width, for the air to pass through.

These distributors being introduced through corresponding openings in the brick-work, may be as numerous as shall be found useful, according to the size and draft of the furnace, and the nature of the fuel used,—the most bituminous coal, and the largest furnaces, requiring the greatest number. Any of these tubes can readily be introduced or withdrawn. One end of these distributors is closed, but the sides are perforated with numerous holes, either circular or oblong, as shewn in the drawing, through which holes the air will be drawn or forced, as the case may be, so as to intercept the gas as it passes from the furnace between and beside the distributors; the object being to cause a thorough admixture of the atmospheric air with the gas immediately on its issuing from the body of the furnace, and before it is cooled down to the point of depositing its carbon in the form of smoke, in the same manner and for the same purpose as air is introduced into the centre of the body of gas issuing from an Argand gas burner or oil lamp.

This admixture, by means of small jets issuing from the numerous apertures which at once introduce the air to all parts and sections of the great body of gas escaping from the furnace, is the more essential, as it is found, that where the required quantity of air is introduced in a body, through large pipes or orifices, the gas and the air requiring time to effect the necessary contiguity of their parts, have not been adequately incorporated until they have passed beyond the igniting temperature of the furnace.

These distributors, being at a red heat, will also promote the heating of the air as it passes through them, and issues from their numerous apertures; and it will further maintain the high temperature at which the gas should be kept after having received its due volume of air, and which is an indispensable condition of its combustion.

Another mode of effecting the admixture of the gas and the air, consists in having the bottom and sides of the flue or flame-bed, for any required distance from the bridge, covered or lined with flat fire-clay tiles, perforated with numerous apertures, and in connection with the air chamber. These perforated tiles will, in this case, act the part of distributors, and may be adopted where there is not sufficient capacity in the flue to admit either the horizontal or vertical distributors, as here described.

In placing these distributors, care must be taken that sufficient space be left between them for the passage of the gas and vapours generated in the furnace, without their being throttled or ***wire-drawn.***

In fig. 1, *e*, is a tube perforated with holes from $\frac{1}{4}$ to $\frac{1}{2}$ an inch in width. This tube, which is closed at the inner end, I call the ash-pit air distributor, as it is intended to distribute the air uniformly to the entire under surface of the fire-bars, and among the ignited fuel upon them. The mouth of the ash-pit is to be closed by doors, to prevent the admission of air, except through the pipe *e*, which may be from 9 to 12 inches diameter, according to the size of the ash-pit, length of the bars, and general draft of the furnace. One effect of this tube will be to prevent any undue portion of air being directed to such parts of the bars as may be least covered with fuel, and therefore presenting greater facilities for its entrance; such partial attraction and admission of the air causing much waste of fuel, particularly at the sides and towards the back part of the furnace; an irregular and undue intensity of heat by such partial blasts; and the consequent formation of clinkers and melting of the bars.

These ash-pit air distributors also present a favorable opportunity for supplying air by an artificial blast from a fan, cylinder, or other mechanical means, where the natural draught may be insufficient, or the increase in quantity may be desirable.

Fig. 5, represents the section of a marine boiler, the distributors *d*, *d*, being placed vertically, on account of the flues being so much narrower than in land boilers, and not permitting any approach at their sides. The supply of air to the gas is here brought from an air chamber c, placed under the bridge and flame-bed, and which chamber is supplied by tubes *g*, *g*, to be hereafter described. The number of these distributors may here also be varied according to the capacity of the flues, and the description of the fuel used.

The tubes *g*, *g*, figs. 5 and 10, are shewn as passing through the water-ways of the boiler, a convenient situation, as being thus out of the way, and not likely to be out of order. They may also be made to enter the air chamber through the ash-pit, as shewn at figs. 6 and 7.

Another mode of conducting air to this chamber, is by laying a second or false bottom to the ash-pit of iron plate, or flat tiles, under which a space of 2 or 3 inches may be left for the air passage, and which will, in such case, act the part of the tube *g*. When this plan is adopted, care must be taken that no aperture be left at the sides or end of the ash-pit, by which any air might escape into it. In every case care must be taken that the air tubes act independently of the currents of air in the ash-pit, but which would not be the case were the air introduced to the distributors by any aperture in such ash-pit at the end or sides; a mode which has been adopted where a double bridge has been used, but which plan has been found uncertain in many instances, by reason of all or the greatest portion of the air being attracted from the body of the ash-pit upwards towards the bars; and as this attraction goes on with a rapidity proportioned to the intensity of the heat in the furnace, and the facility with which it is enabled to pass through the bars where they are but partially covered, it frequently happens that no air whatever will be left to pass through such aperture or double bridge. These tubes should be made with as large a capacity as circumstances will admit, their shape being a matter of no consequence.

The admission of air may be regulated by slides, as no more air should be admitted than will be found sufficient to consume the combustible gaseous and fuliginous matters, and prevent the deposition of the carbon and formation of smoke in the flues.

The greatest error in ordinary practice is the admission of too much air at the ash-pit, which not only involves a great waste of fuel and heat, but, by causing too much oxygen to be there combined with the carbonaceous matter on the bars, sets so much nitrogen free as materially to obstruct the process of combustion further on in the furnace flues, whereby many injurious gases, of which nitrogen is the base, are generated.

Fig. 6, represents the end view of a marine boiler, in three sections, shewing several situations in which these air tubes may be placed. In the two furnaces to the right, (Nos. 1 and 2,) these tubes *g*, *g*, are seen placed in the centre of and passing through the ash-pit air distributor *e*, a convenient situation, where such air distributor may be made sufficiently capacious. In the centre sections, (Nos. 3 and 4,) these tubes are placed on each side of the air distributor, as also seen in fig. 7. In the left-hand sections of this boiler, (Nos. 5 and 6,) the tubes are shewn as entering and passing through the water-ways to the chamber C, as already described. In this figure, L, L, represents an iron plate passing along the front of the boiler, and affording a convenient rest for the several tubes and ash-pit distributors, and for hanging the ash-pit doors to.

Fig. 8, is a front elevation of the furnace in the fire room; R, the fire door; *g*, *g*, the air tubes; *e*, the ash-pit distributor; P, P, falling doors to close the ash-pit entrance, which should, in all cases, be well filled.

Fig. 9, is a section of fig. 5, across the air distributors, and shewing also the position of the bars and door-way N, by which access can be had to the chamber C, and from which any of the distributors, when accidently broken or burned away, may be conveniently replaced. Instead of this door N, an arch may be thrown across in the brick-work, and afterwards built up, a corresponding arch being thrown across and built up in the inner wall of the chamber, as seen in fig. 12, to give occasional access to the flues.

Fig. 10, is a plan of fig. 5, shewing the sections of distributors and the situations of the air tubes *g*, *g*.

Fig. 11, is a section of the same, shewing the iron sleepers *h*, and cross bars *i*, *i*, on which the bricks, forming the flame-bed, are placed; and in which bricks the ends of the vertical distributors are imbedded to give them stability. To increase this stability further, in a steam ship, if necessary, a fire-clay slab may be placed across their upper ends, with grooves, into which they may be made to fit.

Fig. 12, is a cross section of the same, shewing the manner in which the cross bars are laid on the sleepers, and also the brick-work closing the back of the air chamber, with the arch as above described.

Fig. 7, is a section of a marine furnace. M, is the false moveable bridge, made of fire-clay, in one piece, or it may be conveniently made of ordinary fire-blocks. The object of this separate bridge piece is to give an elevation at the end of the bars to prevent the fuel from passing too far, and interfering with the distributors, where there may not happen to be space or capacity enough at the throat of the furnace to allow of the bridge being raised to the usual height. In such case, the use of this false bridge allows of longer distributors being used, and by making it moveable it gives the means of extending or shortening the range of effective fire surface in the furnace.

Fig. 13, is a longitudinal section, and fig. 14, a cross section of a boiler, shewing a desirable plan for using the distributors, particularly where the flue is not sufficiently capacious to admit full-sized distributors, or where the bottom of the boiler is of a circular or irregular shape. In this case it will be sufficient if the distributors rise 10 or 12 inches from the flame-bed, leaving an interval between them and the boiler above them, as shewn in the drawing.

It will here, however, be advisable, though not absolutely necessary, to introduce, transversely, three-inch fire-blocks *t*, *t*, fitted to the shape of the boiler, and projecting downwards, alternately, between each distributor. The effect of these will be to prevent the stream of unignited gas from passing over the distributors without coming in contact with the jets of air issuing from the orifices of some of them. The air tubes may be introduced through the brick-work in any convenient situation.

I would here observe, that in all furnaces, using bituminous coal, the operation of charging should be so managed that there be always in the furnace a portion of coals giving out gas; the quantity of gas generated being as uniform as possible, to avoid the extremes of having too much at one time, and too little at another; the reason of this is obvious, as the supply of atmospheric oxygen should be in proportion to the quantity of combustible gas generated.

The best mode of effecting this purpose of producing equal quantities of such gas in equal times, is by charging parts, or sections only, of the furnace at one time; by which means one part of the bars will be covered with fresh fuel, while other parts, at the same time, will have clear red fuel on them, more or less, in a state of incandescence. This mode of alternate charging will be found most economic and effective.

The operation of feeding the furnace to produce this effect, may be performed by means of an iron box or charger, as practised in many gas establishments.

An oblong box, as large as the door of the furnace will conveniently admit, and sufficient to contain one-half or one-fourth of a full charge, (as the case may be,) being filled, is thrust rapidly into the furnace by means of long projecting handles, and instantly emptied on that section of the bars intended to be covered,—the process of charging the other sections, alternately, being carried on at stated intervals. In this way the longitudinal halves of a furnace may be charged alternately; or, if the furnaces be very large, the charging may be divided into four alternate operations, one for each quarter.

This mode of feeding has many advantages:—1st, in being less laborious; 2nd, in requiring the doors to be kept open for shorter intervals during the operation, and thus not exposing the body of the furnace and boiler so long to a current of cold air; and 3rd, in enabling the engineer to know exactly what quantity of coals are consumed in a given time, which he cannot directly tell when the fire is fed by a shovel.

Fig. 15, is the longitudinal, and fig. 16, the transverse section of a locomotive boiler, shewing the mode of applying the distributors to the ordinary fire tubes. In this figure they are seen entering those fire tubes and passing through two-thirds of their length. These distributors are, as before mentioned, closed at the inner end, and perforated with holes, which, as the air passes through them, present the appearance of numerous jets of flame, striking against the inner surface of the fire tubes, as though it were a body of flame, instead of air, which they distributed.

These distributors are supplied with air from a box o, placed so as to receive a strong current from the forward motion of the engine, and through which they may be, at any time, withdrawn when the fire tubes require cleaning out. The opening of this box may be regulated by a register. In the drawing, w, is the fire box; *x*, the ash-pit; *y*, the door of ash-pit, which, when the engine is in motion, is kept open; but, when at rest, this door, by being closed, causes a great saving of fuel. *z*, *z*, are the ordinary fire tubes, and *d*, *d*, the distributors.

As I do not confine myself to the particular number, dimensions, or situation of the several parts here described, they may be varied to suit the constructions of furnaces and boilers, and the circumstances under which they may be placed, and which may be effected by any competent persons;—these, my inventions, being applicable and intended to apply to all descriptions of furnaces, stoves, or boilers, where coal is consumed.

That the above arrangements for producing the greatest calorific effect, may be better understood, I add the following observations:—

Hitherto, in the construction of furnaces, due attention has not been given to the chemical conditions of the formation of smoke, and the important distinction which exists between the volatile and the fixed constituents of coal; the circumstances under which they respectively give out heat; and the peculiarities of their respective modes of combustion. Smoke is the result of the imperfect combustion of the volatile products of coal, in consequence of their being mixed with either too small or too large a proportion of atmospheric air, while the temperature of the mixture is below the point, either of its accension or complete combustion, Either of these circumstances, that is, too little air with a high temperature, or too much air with a low temperature, causes the separation of the carbon from the hydrogen, and the consequent change of the carbon, from the colorless invisible state of gaseous combination, into a black palpable and pulverulent form.

The carburetted hydrogen gases require, as the condition of their complete combustion, 1st, that they be intimately blended with an appropriate volume of atmospheric air, which volume varies with the nature of the combustible gas; and 2nd, that after having been so mixed with the air, the mixture be then heated to its temperature of accension, or be brought in contact with flame,—in other words, that they be kindled or lighted, as a jet of gas is lighted on its issuing from the orifices of the beak.

Again, as one cubit foot of carburetted hydrogen gas requires two cubit feet of oxygen, or about ten cubit feet of atmospheric air, while one cubit foot of bicarburetted hydrogen (or olefiant gas) requires three cubit feet of oxygen or fifteen of air, to effect complete combustion,—these proportional volumes of air must be supplied, and so intimately blended, as to bring the combustible gases and atmospheric air within the sphere of their reciprocal chemical attraction; for, otherwise, the inflammable gases will not be completely saturated with oxygen, that is, will not be consumed; and, consequently, the full calorific effects of the body of gas, generated from the coals, will not be obtained.

Now, in ordinary furnaces, as generally constructed, the air cannot reach the body of gas that escapes from the fireplace into the flues, except by passing through the highly ignited fuel laid upon the bars of the grate, whereby much of its oxygen gets saturated, inert, and incapable of consuming or burning the residuary combustible gases and fuliginous vapours, to whatever intensity of heat the æriform mixture be subjected.

The unignited gaseous mixture, in travelling through the flues, loses temperature very fast, and deposits the eliminated carbon in the form of sooty smoke. Thus not only much of the carbon, but a good deal of the hydrogen, with which it was previously combined, are lost to the furnace for the purposes of ignition and heat; while some of the hydrogen, uniting with the nitrogen, forms ammonia, or gas, which, by its presence, is eminently obstructive of the high temperature of flame.

It will now be seen that the construction of my furnace, and the principles on which it is based, are strictly in conformity with the complex chemical processes going on in the furnace, and serve to supply each process with the materials necessary to its completion, and in their proper order:—1st, the generation of the combustible gas from each fresh charge of fuel, by the radiant heat resulting from the preceding charges, then in a high state of incandescence; 2nd, the supplying such gas with the quantity of oxygen required for its most perfect chemical union and combustion, and this in a manner most favourable to their instantaneous and complete intermixture; 3rd, the effecting this incorporation of the gas, and the atmospheric air, not only in the proper quantity, but at the proper time, that is, before the mixture has passed into the flues beyond the influence of the high temperature essential to ignition; 4th, the supplying this atmospheric air from a source independent of the currents in the ash-pit, and thus preventing its coming in contact with the incandescent carbonaceous fuel on the bars, which would, in such case, have deteriorated it by saturating much of its oxygen; 5th, the separating the two portions of air, respectively required for the volatile and the fixed portions of the coal, and preventing any interference of the one with the other, which might have disturbed or affected the complete operation of each.

Having thus described the nature of my invention, and the modes of carrying the same into execution, I do not claim the introduction of air to the bridge, which has already been done by others; neither the plan of increasing the current of air by an artificial blast; but I specially and exclusively claim as my invention, first, the use, construction, and application of the perforated air distributors, by which the atmospheric air is more immediately and intimately blended with the combustible gases generated in the furnace. Secondly, the application of distinct pipes or tubes, by which the air is conducted to the gases at the bridge and flame-bed, in whatever situation they may be placed, where such pipes or tubes are the means of bringing such air to the gas, independently of the air in the ash-pit, or other part of the furnace or flues. Thirdly, the use and application of separate perforated tubes, situated in the ash-pit, as the means of distributing, uniformly and along the under side of the bars, the air which is intended to be applied to the ignited fuel on them. Fourthly, the application of a current of air, artificially created by a fan or other mechanical means, when in connection with such pipes and air distributors, as a means of regulating the quantity of air to either class of air distributors. Fifthly, the use of a moveable false bridge, laid on the bars, by which the extent of the fire surface may be increased or diminished.—[*Inrolled in the Rolls Chapel Office, December* 1839.]

Specification drawn by the Patentee,—the Chemical Analysis by Dr. Ure.

To Joseph Green, *of Ranelagh-grove, Chelsea, in the county of Middlesex, gentleman, for an improvement on ovens.*—[Sealed 2nd June, 1838.]

This invention consists in rendering the reflected heat of an ordinary Dutch oven, or other oven acting on the same principle, more efficient and available for the purpose of baking:—first, by covering the material to be baked, when placed on the shelf of the oven, with a close cover, so fastened to the shelf as always to retain the same relative position to the top, bottom, and sides of the oven, as is most conducive to the effect required; and secondly, by placing a reflecter or curved plate at the bottom of the oven, corresponding in curve with its domed top, or nearly so.

Plate XIX., fig. 1, represents a side view of one of my improved ovens, in section, shewing the relative distance at which the new parts are kept from the back, top, and bottom of the oven. O, O, is an ordinary tin Dutch oven; H, is the handle by which the whole is lifted; S, is a moveable shelf of rolled plate iron, resting on two side brackets and one back bracket B, B, B; this shelf should be one-eighth of an inch smaller than the oven, except at the back, where it rests on the bracket, and at the front where it touches at each side. On the shelf is a cast-iron cover C, which is attached to the shelf at the back part by a hinge or joint J, as here shewn, and should fit down perfectly close. On the shelf P, is supposed to be a pie or pudding, undergoing the process of baking; R, is a curve or concave reflecting plate made, like the oven, of tin, and corresponding, as nearly as may be, with the curve of the top of the oven. This reflecting plate rests against the end of the back bracket, and is kept from sliding forward by the lip or rim in front of the bottom of the oven. Fig. 2, is a front elevation of fig. 1. Fig. 3, is a separate view of the shelf and cover removed from the oven, the dotted lines shewing the position the cover would take when thrown completely back on its hinge. Fig. 4, is a stout holder or instrument, made of round iron rod, for removing the shelf from the oven when hot. Fig. 5, is a diagram shewing the shape of the shelf in plan, and its distance from the sides of the oven.

I claim as my invention the projecting iron shelf and cover united to it by a hinge, in order to preserve it at one settled distance from the back and sides of the oven; and also the reflecting plate underneath all, as applied to an ordinary Dutch oven, or any other oven on the same principle, thereby constituting my said improvement on ovens. —[*Inrolled in the Inrolment Office, December*, 1838.]

To WILLIAM HAWES, *of Old Barge-house, Christ Church, soap manufacturer, for improvements in the manufacture of soap; parts of which improvements are applicable to preparing tallow for the manufacture of candles.*—[Sealed 12th June, 1839.]

THIS invention is for a method of obtaining saponification, by mechanical means, instead of boiling the tallow or other fatty materials with the alkaline leys, as in the ordinary process of soap making.

An upright shaft, having radial arms affixed thereto, is placed or mounted in the boiler, or other vessel containing the tallow or other fatty materials, and is caused to revolve by any suitable mechanical contrivance. Upon the upright shaft being put in motion, the alkaline ley is poured in slowly, and a perfect incorporation of the ingredients takes place, by means of the radial arms on the upright shaft. Other mechanical contrivances may be adopted to cause the required admixture of the materials, but the patentee prefers the one mentioned.

The tallow in the boiler is to be kept at as low a temperature as is compatible with its remaining in a state of fluidity. No alteration in the proportions of the ingredients is required; and it is easy to ascertain when saponification takes place, as the ingredients begin to thicken directly that it commences.

The same mechanical contrivance is used for producing the saponification of tallow for the manufacture of candles. The cream of lime used in this process being added gradually in the same manner as the alkaline ley in the manufacture of soap. The fatty materials do not require boiling in these processes, but are kept dissolved at a low temperature by the application of a gentle heat

The patentee claims producing saponification by mechanical means, without submitting the materials to the boiling process.—[*Inrolled in the Inrolment Office, December,* 1839.]

To Charles Green, *of Birmingham. in the county of Warwick, gold plater, for improvements in the manufacture of brass and copper tubing.*—[Sealed 27th June, 1838.]

These improvements in the manufacture of brass and copper tubing consist, in casting the copper or brass in short tubes, with the same, or nearly the same internal diameter, and a larger external diameter than those of the intended tubes when finished, and afterwards drawing or forcing the tubes through holes or dies until they have attained the length, form, and thickness desired;—my process being similar to that for which John Wilkinson obtained letters patent, in or about the year one thousand seven hundred and ninety, for a method of making lead pipes; which latter process has, since the expiration of the said patent, become commonly practised; but the said process of Wilkinson, so far as my knowledge extends, has never been applied to the fabrication of tubes of copper or brass.

I shall now describe the method of making copper or brass tubes, as commonly practised, in order to shew, more plainly, the advantages of the method for which I have obtained Her Majesty's letters patent.

The common method or mode of manufacturing copper or brass tubes or pipes, consists in first casting the copper or brass into ingots, and subjecting the said ingots to the rolling or laminating mill, in order to reduce the thickness of the said ingots to the thickness, or nearly so, of the intended tubes; the metal is then sheared or cut into the necessary widths for making the tubes or pipes required. The edges of the said strips are made to approach together, by bending the strips in the direction of their least dimensions, and, by means of solder, connecting the edges or seams together, either by what is commonly known in the trade as a lap joint or a pimp joint, the former having the edges bevelled, those of the latter being square; such tubes, after having their edges soldered or brazed together, are submitted to the operation of the draw bench, and draw plate or die, the tubes being drawn through a number of holes, as in the drawing of wire or lead pipes, until they are sufficiently reduced in diameter.

Now, in my improved method of manufacturing copper and brass tubes, I cast the copper or brass upon a core, or mandrill of core sand, or other proper material,—and within a matrix or mould of iron or sand, as may be most convenient, the core being of the dimensions which I intend to give to the tube internally, or nearly so, and the matrix mould of the dimensions which I intend to give to the cast tube externally; I then insert a mandrill within the tube, and subject the cast tube to the operation of a draw bench, and draw plate or dies, until the external diameter of such tube is reduced to the thickness required; the internal diameter being supported by the mandrill inserted within the tube, is prevented from diminishing, as it would were the tube subjected to the operation of the draw bench, and draw plate or dies, without the support afforded to it by the mandrill.

The copper or brass tube being drawn or forced, as above, by a draw bench, through a draw plate, dies, whirtles, collets, or holes, successively decreasing in area, the copper or brass tube is reduced in external diameter, and extended to the required length, retaining the necessary thickness of metal of the tube. The brass tube, being a mixture of zinc and copper, (of which brass is composed,) will require, after having been drawn or forced through the draw plate, dies, whirtles, collets, or holes, to undergo a process called annealing, in order to restore that degree of malleability to the brass of which the process of drawing deprives it; such annealing process is also necessary in manufacturing copper tubes, but as copper is a softer metal than the different compositions of copper and zinc, called and known by the name of brass, tubes formed of copper will require less annealing than those formed of brass, which annealing is a process well known, and commonly practised by workers in copper and brass, and therefore need not be further described, as the quantity of annealing requisite will depend upon the skill and judgment of the workman employed in the manufacture of tubes, whether such tubes are formed of copper or of brass.

As my improved method of making tubes of copper and brass without any seam or soldered joint, will require a draw bench of greater power than those now in use, on acccount of the greater than ordinary thickness of metal required in my process, I proceed to describe the apparatus by which I manufacture the same, though I lay no claim to such draw bench or apparatus, except so far as drawing brass and copper tubing without a seam or joint, is concerned, as before described.

Plate XIX., fig. 1, represents a view of my draw bench, in which an endless screw A, actuates or drives a worm wheel B, on the end of the shaft C, and firmly attached thereto a wheel D, (round which the chain E, coils by the rotation of the wheel D,) is actuated through the medium of the shaft C, and turns with it; the end of the chain E, is attached to the connecter and mandrill by the mode shewn in the drawing, or it may be attached by pincers in the usual method. Motion is given by a steam engine, or other power, to the worm-wheel, which puts in motion the chain in a longitudinal direction, and draws the tube and mandrill within it attached thereto, by either of the methods above described, through the hole in the die, whirtle, collet, or draw plate; which die, whirtle, collet, or draw plate, is shewn at G, fig. 1, together with a tube and a mandrill or triblet, within the said tube; upon which mandrill or triblet the said tube, whether of copper or brass, is extended to the required length by being passed through holes, which decrease in area so as to form the tube required.

The wheel D, to which the chain is attached, admits of being thrown out of gear or disengaged, the chain being drawn back by hand; on re-engaging the wheel D, the operation of drawing the tube can be repeated.

Fig. 2, is a side elevation of my draw bench, where corresponding parts of fig. 1, are marked, or designated by like characters. The draw plate, die, collet, or whirtle, is shewn in section, with the tube and the mandrill or triblet, within the die, collet, whirtle, or draw plate.

Fig. 3, shews a sectional elevation of a connecter, to be screwed on to the end of the mandrill or triblet, and attached to the chain, as before described, after the end of the mandrill or triblet has been forced through the copper or brass tube, such connecter being also used for the purpose of drawing the mandrill or triblet out of the copper or brass tube at the reverse end, previously to such tube undergoing the process of annealing, as before described; and which mandrill or triblet must be forced into such tube before it is again subjected to the operation of the draw bench, and draw plate or die, after each annealing; and the number of such annealing processes must obviously depend upon the thickness and quality of the metal of which such copper or brass tube is composed, as well as the skill and judgment of the workman employed in the manipulation.

Fig. 7, is a sectional elevation of the mandrill, shewing the screwed ends, with a finished tube upon the mandrill.

Fig. 8, is a sectional elevation of the said tube before being submitted to the operation of the draw bench; and it will be perceived by the end view of fig. 8, that the tube, whether of copper or brass, has no seam or soldered joint, such tube being prevented from slipping over the mandrill by its truncated or contracted end, as shewn in the sectional drawings, figs. 7 and 8; which method, for peventing the tube from slipping over the mandrill, is commonly practised in drawing lead pipes or tubes under the said process of John Wilkinson, before referred to.

Figs. 4, 5, and 6, are respectively a side elevation of a copper or brass tube, from the casting,—a sectional elevation of the same, shewing the thickness of metal and the form of the reduced or truncated end, to prevent the tube slipping over the mandrill,—and a sectional elevation of a finished tube.

Fig. 9, shews another method which I use in the first process of drawing brass and copper tubes. A, is a plan, and B, a side elevation of a tool, through which the tubes are passed, and is composed of four sheaves or blocks, revolving upon fixed axles, similar to the sheaves of pulley-blocks, placed as shewn in the drawing, and which sheaves grasp the tube, on motion being communicated to it by the draw bench, which tool, as above described, is, when used, fixed in like manner, and substituted for the draw plate or whirtle, as shewn in the plan and elevation of the draw bench, at figs. 1 and 2.

Fig. 10, shews a section and elevation of an iron tube, upon which the cores are made. In order to facilitate the removal of the mandrill from the finished tube, I insert the finished tube and mandrill within another tube, the internal diameter of which is equal to the external diameter of the finished tube, and which, on the mandrill being withdrawn, prevents the finished tube from puckering, bulging, or splitting.

Having described the nature of my invention, and the manner in which the same is to be practised and carried into effect, I now proceed more particularly to what I claim, under the letters patent granted to me for my improvements in the manufacture of brass and copper tubing, that is to say,—my improvements in the manufacture of brass and copper tubing, consist in casting such tubes of copper or brass after the method for which John Wilkinson obtained letters patent for a method of making lead pipes, and for the manufacturing such copper or brass tubes without seam or soldered joint, by the methods inserted and described in this my specification.—[*Inrolled in the Inrolment Office, December*, 1838.]

To Robert Essex, *of the parish of St. Mary, Islington, in the county of Middlesex, silversmith, for his invention of certain improvements in the construction of paddle wheels, and in the paddle boxes or cases of steam vessels.*—[Sealed 8th February, 1838.]

This invention of certain improvements in the construction of paddle wheels, and in the paddle boxes or cases of steam vessels, applies only to such steam vessels as are furnished with masts, rigging, and sails, to enable them to take advantage of favorable winds, and either act in conjunction with the steam and assist in propelling the vessel, or to be used by themselves, independent of the steam power;—and the object of my improvements is to construct and apply the rotary paddle wheels, with their paddle boards, to steam vessels, in such a manner that the use of the same, for propelling the vessel, may be suspended or dispensed with when required, and a portion of the paddle wheel removed from out of the water, so as not to interrupt the sailing of the vessel, which it would do if allowed to remain in the water in a quiescent state;—and consists in constructing and adapting the paddle wheels and their paddle boxes in such a manner that a portion of the paddles and the wheels (as quadrants, sections, or segments,) may be easily and readily removed out of the water, and placed within the paddle boxes or cases, or other convenient situations, where such portions will be secure from damage, and ready to be easily applied to the wheel when again wanted;—the improved paddle boxes being constructed and adapted to receive and retain the said portions of the wheels and paddles,—all of which will be better understood by reference to the accompanying drawings and following description of the different modifications thereof, that is to say:—

Plate XX., fig. 1, is a side elevation or representation of a paddle wheel, with such part of the framing of the paddle box or case as will serve to illustrate my improvements therein, and one method of carrying my invention into effect, the side-casing of the paddle box being removed to shew the interior. Fig. 2, is a plan view of the same, the top casing in this figure being taken away; the paddle wheel being shewn in both figures as when ready for propelling the vessel. Fig. 3, is a similar representation to fig. 1, shewing a portion of the paddle wheel removed from out of the water and resting within the paddle box or case, as when the steam power is dispensed with. Fig. 4, is a plan view of the same; A, A, is the side of the vessel; B, B, the main timbers or framing of the paddle box or case, secured and built into the framing of the vessel in the usual way; C, C, is the paddle wheel; D, D, the paddle-wheel shaft mounted, turning in proper bearings on the beams or framing, as in common. The wheel is composed, as usual, of several rings or hoops of iron, and radial arms, extending from the centre or boss to the periphery, all of which parts are firmly bolted together, the radial arms carrying the paddle boards as usual; but, by my improvements, the wheel is separated into two or more parts or sections, which, when put together, are firmly secured to one another by strong joints, and screw bolts and nuts, as will be hereafter described.

Portions of the outer rims or hoops of iron, which are at all times firmly attached to the paddle-wheel shaft, are shewn at *a, a,* and *b, b*; *c, c,* and *d, d,* are those portions which are to be occasionally detached from the wheel; *e, e,* is the inner or more central ring, which may either be formed in one piece, and at all times attached to the paddle shaft, or it may be made in two parts, one moveable, the other attached, as thought desirable; *f,* is the boss nave of the wheel, firmly secured, in the usual manner, to the shaft D; *g, g,* are the paddles, which are to remain with the wheel; and *h, h,* those which are capable of being removed therefrom. The portion of the outer rim *c, c,* is firmly secured, when the wheel is in action, to the other part *a, a,* by the strong hinge-joint at *i,* the bolt of which passes through all the outer rings, and is secured by a screw and nut at the end, and also by the other junction of the outer rings at *k,* and *l, l,* they being secured in like manner by strong screw-bolts and nuts, and the moveable portion *m,* of the central ring or hoop *e, e,* is also firmly bolted to the continuous ring when the wheel is in working order; *o, o,* are extra braces to strengthen the junctions of the parts of the wheel, and through which screw-bolts and nuts may be passed, if thought necessary; *p, p,* is the casing of the paddle box, which, in this instance, is extended beyond the usual size, in order to cover the parts of the paddle wheel when out of use; *q, q,* are railways or ledges for receiving and guiding the moveable part of the wheel into its proper situation when out of work;—these railways or ledges are placed on each side of the wheel, and are formed with moveable parts or ends at *r,* which are so constructed (in this instance with hinge-joints) as to be capable of being turned up out of the way when the paddle wheel is in working order, and projected forward so as to come in the way of the small pullies or wheels *s, s,* when the portion of the wheel is being detached;—these wheels are placed turning on studs or pins in the end of the part *c,* of the outer ring; *t,* is the beam or timber for receiving the moveable portion of the paddle wheel when it is disconnected from the shaft.

Whenever it is wished to detach the portion of the paddles and use the sailing power only to propel the vessel, the paddle wheel is o be stopped with the moveable portions upwards. The ends *r, r,* of the railways *q, q,* are then to be projected so as to come in the way of the wheels *s, s.* When this is done, all the screw-bolts of the various joints at *k, l,* and *m,* are to be removed, the bolt of the hinge-joint *i,* remaining undisturbed. The paddle wheel is then to be "backed" or turned slowly the reverse way to that for propelling forwards; the wheels *s, s,* will then come into contact with the ends *r, r,* of the railways or ledges *q, q,* and consequently the wheels *s, s,* will be made to run along the rails or ledges and bring the moveable portion of the wheel into the positions shewn in figs. 3 and 4, when this portion of the wheel will rest upon the ledges *q,* and the beam *t.* The paddle wheel being securely fastened in this position, the sailing of the vessel will go on without interruption from the paddles.

When it is desired again to apply the steam power, the wheel must first be released and then turned slowly forwards, by which the moveable portion of the wheel will again be raised and drawn from off the rails or ledges *q,* and brought on to the permanent portion of the wheel, at which time the screw-bolts of the joints *k, l,* and *m,* are to be applied, and the whole firmly secured, when the wheel will be ready for action.

It will be seen that the whole of these operations are effected in the upper part of the paddle boxes or cases without the necessity of any person going under them, there being proper doors or openings in the casing to allow the workmen free access to the paddle wheels.

Another method of carrying my invention into effect is shewn in fig. 5, of the accompanying drawings, in which the moveable portion of the wheel is shewn constructed in two parts E, and F, which are to be placed one before and the other behind the paddle wheel. When this plan is to be put into operation, the moveable portions are to be detached from the wheel below the paddle casing, and drawn up into the box with suitable tackle, and properly secured therein. The junctions of all the parts are to be firmly secured by screw-bolts, as in the former instance; and the construction and manner of applying this modification of my invention being easily understood, it is not necessary for me to enter into further detail. The same letters of reference being marked upon corresponding parts, as in the former figures, no further description will be necessary.

And further, I would remark that the moveable portion of the wheel, as seen in figs. 1 and 2, may be removed in the same way by hauling it up into the paddle boxes from the under side; but this mode would be attended with more trouble and labour than the method above described.

Having now described the nature of my invention, and the manner of carrying the same into effect, I would remark that, if it should be thought desirable, the whole of the moveable portion of the paddle wheel may be detached from the wheel by withdrawing the bolt of the hinge-joint at *i*, and the same may be removed from out of the paddle boxes or cases and placed in any convenient and secure situation; and when this is done, I should apply proper moveable cranes, staunchions, and tackle, to the paddle boxes, for the purpose of facilitating the removing and applying of the detached portion of the paddle wheel, the manner of doing which is well known to all practical engineers, and need not be described by me.

And, in conclusion, I wish it to be understood, that I do not mean or intend to claim, as my invention, the removing separately the paddle boards from the wheel, or any plan whereby the portions of the wheel, or part of it, is left in the water, so as to interrupt the sailing of the vessel; but what I claim, as my invention, is the constructing, adapting, and applying the paddle wheels to steam vessels, so that portions or sections, segments or quadrants of the wheel, may be easily and readily removed from out of the water when the steam power is to be dispensed with, and again applied when required; and the constructing and adapting the paddle boxes or cases with suitable bearings, and railways or ledges, to receive the said detached portions, as above set forth and described.—[*Inrolled in the Rolls Chapel Office, August* 1838.]

Specification drawn by Messrs. Newton and Berry.

To WILLIAM JEFFERIES, *of Holme-street, Mile End, in the county of Middlesex, metal refiner, for his invention of certain improvements in the process of smelting or extracting metal from copper and other ores.*—[Sealed 22nd May, 1839.]

THE object of my invention is to obtain copper and other metals from the ore in a more economical manner, and in a better state or quality than can be effected by the methods or processes commonly employed, and consists in an improved process of calcining, or roasting and preparing the ores for the after process of smelting; and also in the use and application of novel or improved constructions of roasting or calcining furnaces, ovens, or chambers, for effecting such calcination of the ores.

I will first describe my improved construction and arrangement of roasting or calcining furnace or oven, and then my improved process connected therewith, and mode of preparing for smelting.

Plate XX., fig. 1, is a vertical section of one of my improved constructions of calcining furnaces, shewing two ovens or roasting chambers connected in one building; but they may be constructed separately, or three, four, or any other number, side by side; fig. 2, is a horizontal section taken through the same in the line *a*, *b*, shewing the flooring of the ovens or calcining chambers; and fig. 3, is another horizontal section taken in the line *c*, *d*, and shewing the flooring of the upper chamber.

These improved furnaces may be constructed of any form that shall be considered desirable, either square, round, octagonal, or of any other figure, though I prefer the form shewn in the drawings, as it is most convenient. The furnace consists of the walls A, A, which are built of brick-work or stone, in the ordinary manner. The furnaces are divided by the two horizontal floors or partitions B, B, and C, C; the floor B, forms the roof of the ash-pit D, as well as the floor of the roasting or calcining chamber or oven E, and the partition C, forms the roof of those ovens or chambers E, as well as the floor of the upper chamber F; the smoke and vapours arising from the roasting of the ore is allowed to pass through the openings G, G. In these chambers F, the vapours become condensed, and the sulphuric acid and other heavy parts of the vapour may be collected in suitable vessels, by which the deleterious matters, usually thrown off into the atmosphere, will, in a great measure, be arrested, and their unpleasant consequences prevented.

The roof or covering H, H, of these upper chambers F, F, are formed of arched brick or stone-work, as in fig. 1, and the uncondensed parts of the vapour or smoke may be allowed to pass off by the chimneys I, I, or by any other suitable apertures.

The lower compartments or ash-pits D, are furnished with doors J, J, which may be opened or closed according to the draft required through the furnace during the process of calcining or roasting of the ores. These doors also serve for the removal of the ashes and ores falling from the chamber above.

It will be seen that the horizontal partitions or floors B, are pierced with a number of small apertures for the admission of air from the ash-pits D, D, to the chambers or ovens E, F, in order to support the combustion of the coal or fuel mixed with the ore, and thereby effect the roasting or calcining of the charge of material.

The ovens or chambers E, are also furnished with doors K, K, for the introduction of the fresh charges of ore and fuel, and also the removal of the same when the process of roasting or calcining is completed. The ovens or chambers are also furnished with other smaller apertures L, L, for the purpose of allowing the attendant to inspect the state of the operation and the degree of roasting or calcination going on. These apertures are fitted with doors or covers to be opened or closed at pleasure.

The apertures G, G, leading from the ovens to the chamber above, are supplied with dampers, by means of which the draft or passage of the vapour from the ovens can be regulated at pleasure.

Fig. 4, is another vertical section taken through two furnaces built together, but with only one upper condensing chamber F, which, in some cases, may be preferred to those having a separate chamber to each furnace. In this instance the roof C, is constructed in a different manner to the former, and may be of iron, tiled and plastered, or it may be roofed in any other suitable way.

I would remark, that I do not confine myself to any particular shape of the apertures for the admission of air through the flooring of the roasting ovens or chambers, as these may be formed by leaving small spaces between the fire-bricks used for the flooring, or by piercing holes through them (when in the clay state) before they are burnt.

Having described the construction of my improved calcining or roasting furnace, I will now proceed to explain the improved process which I use in conjunction therewith, that is to say:—

The ore is taken in the raw state, in large or small pieces, as it may be brought to the smelting works, and is to be mixed, in the first place, with a sufficient quantity of fuel, as coal, coke, or anthracite coal, to effect the calcination of the ore. The quantity of fuel employed in connection with a given weight of ore, must vary from one hundred weight to three hundred weight of fuel to one ton of ore. The more sulphurous the state of the ore the less coal or other fuel is required for this purpose. The mixture of the fuel and ore is then put into the calcining furnace or chamber E, with a quantity of wood under it, capable of igniting the mass of fuel. The whole of the materials are then set on fire, in which situation the ore is to remain in the furnace, subjected to the action of a slow heat for a space of time sufficient to complete the operation,—say for four, five, or six days, according to the quality of the material. The charge is then to be drawn out of the chamber and wetted, and after laying in a wet state for three or four days or more, it is to be mixed with a quantity of lime, common soda, or any other alkali that may be found more convenient for use. The calcined ore and the alkali is then kept in a wetted state for three days or more, as the nature of the ore may require. If the ore be mixed with common unslacked lime, it will require about two hundred weight to the ton of ore; and after the ore has been subjected to this process, it is ready for the after process of smelting, in the common smelting or reverberatory furnace. If common soda be employed, about half a hundred weight of the alkali will be found sufficient for every ton of ore.

Lastly, I desire it to be understood that I claim, as my improvements in the process of smelting ores, first, the use and application of the construction of furnaces, as described above; and, secondly, the method of submitting the ore to a slow operation of calcining or roasting, by the employment of a small quantity of fuel, kept in a state of slow combustion by the regulated admission of atmospheric air; and, after such roasting, allowing the ore to remain for several days in a mixture of alkali and water, exposed to the atmosphere, when it will be found ready for smelting in the reverberating furnace, the metal being in a much more advanced state in its progress towards purity than by any other ordinary modes of smelting.—[*Inrolled in the Rolls Chapel Office, November*, 1839.]

Specification drawn by Messrs. Newton and Berry.

To Charles Collinge, *of Bridge-road, Lambeth, in the county of Surry, engineer, for his invention of an improvement or improvements in the making or manufacture of axletrees.*—[Sealed 2nd May, 1833.]

The subject of this patent does not apply to axletrees, as above stated, but to the boxes or naves of wheels. The patentee says that, in the operations of heating and cooling the cast-iron boxes of wheels, for the purpose of hardening their internal parts, very great loss has been sustained from the frequent occurrence of cracks in the metal so treated, owing to the unequal substance of the metal in the different parts. He therefore proposes to form his boxes of distinct pieces, and afterwards to connect them together by means which shall render the parts inseparable.

The cylindrical portion of the box is to be made of wrought iron by welding a scalp into the proper figure, in the way that some gun barrels and other iron tubes are commonly made. The internal part of this cylinder is then to be case-hardened. The other parts of the box, which sustain little or no friction, are to be of cast iron, which, having been fitted, are to be expanded by being rendered red-hot, and are then to be placed upon the cold cylindrical portion and allowed to shrink, so as to cause the two parts to adhere very firmly together.

This may be assisted by keeping the wrought-iron cylinder filled with cold water, or by any refrigerating means. Other parts of the naves, such as caps and flanges, which require to be attached to the boxes, having been properly fitted, may be secured by screws or pins, and these being first dipped in a solution of ammonia, will be found to swell by oxydation and attach themselves so firmly to the mass as to be afterwards totally inseparable.—[*Inrolled in the Petty Bag Office, November,* 1833.]

To Joseph Garnett, *of Haslingden, in the county of Lancaster, dyer, for an invention of certain improvements in machinery or apparatus for carding cotton, flax, wool, or any other fibrous substances, being a communication from abroad.*—[Sealed 19th January, 1838.]

These improvements in machinery or apparatus for carding cotton, flax, wool, or any other fibrous substances, consist, principally, in the particular arrangement and construction of the ordinary and essential parts of carding engines, and the application thereto of three or more doffer cylinders, in order to produce a greater quantity of slubbings or rovings from the engine in the same space of time, and a much better quality than can be obtained from such machines as are now in common use. Secondly, the doffer cylinders being covered with rings or fillets of cards, and being three or more in number, the fillets of cards can be so placed that the width of each ring or fillet shall have an intermediate blank or plain space of double such width or space upon the doffing cylinder, which is highly important, especially in carding wool, or other material of long staple, as the fibres are apt to extend crosswise from one fillet to another, and thus to cause frequent breaking of the rovings, as in working ordinary carding engines. And also, I would remark that, by the application and use of three doffers, the fillets or rings of cards upon them may be of one-half the width of those now in use, and thus, consequently, the rovings may be taken off the carding cylinder, in smaller portions, or narrower strips, and in much greater perfection.

Prior to entering into the detailed illustration of these improvements in carding engines, I find it expedient, in order to facilitate the explanation of such improvements, and to enable others to construct them and bring them into practical operation, to describe the whole arrangement and process of carding wool, that of cotton and other fibrous materials being similar, but perhaps requiring some slight modifications to suit the quality of the staple to be operated upon.

Let it be supposed that the wool or other fibrous material is about to be introduced into an ordinary carding engine; the wool having been scribbled in the ordinary manner, is taken from the doffer end of the engine in a slightly twisted state, being in bands or slivers, and which are wound upon a series of bobbins or spools. The bobbins or spools are then laid or placed upon a corresponding series of cylinders or drums, which are mounted in a frame, and caused to revolve by means of gearing from the feed-roller, thus delivering the bands or slivers from off the spools by friction of contact.

The bands or slivers of wool are now to be conducted severally through distinct guides to the operation of the second carding engines. The sheet of carding may be divided into any convenient number of bands or slivers, but the produce of a narrow carding engine, divided into thirty or forty strips, will be found sufficient; these strips or slivers are now to be drawn into one (or two in case of a double engine) from the doffer end of the engine, and again wound upon bobbins or spools, as before, and again placed upon a series of drums, as on the second carder, in order to be submitted to a third carding engine. This third carding engine or "finisher" (as it is sometimes called) is a single carding engine, and fitted with my improvements, having three or more doffers or doffing cylinders placed in front. I would observe, that *three* doffers will be found the most convenient. I also place in front of each of the doffer cylinders a small cylinder or doffer stripper, covered from end to end with a very narrow fillet of cards, laid side by side, and cause them to revolve in the same direction with the doffers, and grind them sharp; then to run in the opposite direction, and hold a soft card against the teeth, in order to bring them to a smooth and round point, which is very essential, as it delivers the slivers more readily and perfect. The slivers are now to be passed forward through separate guides, and also through revolving tubes, or double endless friction belts or straps, (hereafter more particularly described,) in order to produce a slightly twisted roving, which now passes through the drawing rollers, and is wound upon the spools or bobbins, being in a proper state to supply the mule, throstle, or other spinning machinery, without any intermediate operation of slubbing or roving being necessary.

Another mode of feeding carding engines which I might employ, is the application of a cylinder, or what is called a lap drum, which is to be placed in the front of the doffer in the first and second carding engines, and revolving in an opposite direction to the doffer.

The wool or other material under operation is struck off from the doffer, by the action of a comb, in a sheet, and is received upon the surface of the drum in successive layers or windings, which are slightly compressed by the weight of a small roller, bearing upon the periphery of the drum, and turning by the friction of contact.

When a sufficient quantity of wool has been wound upon the surface of the drum, it is to be cut off by passing a knife through it, longitudinally, from end to end; and it is then to be spread in a flat sheet upon the feeding cloth, with which the next carding engine is provided, in a transverse direction of the fibres to the way it was wound upon the drum, so that the two even cut ends of the sheet of wool may be laid in contact, and run parallel with the sides of the feeding trough.

It will be found necessary that the drum should be about two inches more in circumference than the width of the feeding table, which is to receive it, in consequence of a slight contraction of the fibres taking place, which would make the sheet or lap of wool too narrow for the feeding trough; and it is desirable that they should be of equal width, in order that the sheet should feed exactly parallel, and thus produce the side threads of an equal quality and thickness as those in the middle.

Now, in order that these improvements in carding engines may be more clearly explained and distinctly understood, I have attached to these presents a sheet of drawings, representing several views of this improved carding engine, as applied to the third or finishing carder, for operating upon wool, and have marked the same with figures and letters of reference, having placed similar letters upon corresponding parts of the apparatus in all the figures.

Plate XX., fig. 1, is a side elevation of the carding engine; fig. 2, a front elevation of the doffer end; and fig. 3, is a longitudinal section, taken through the middle of the machine.

The main drum or carding cylinder *a, a, a,* is mounted in the side frames or standards *b, b,* and furnished, as usual, with strippers and clearers *c, c, c,* the whole being set in motion by the strap *d,* passing around the driving pulley *e.*

The carding engine is fed by means of the lap or sheet of wool, as just described, being placed upon the endless feeding cloth *f, f,* (see fig. 3,) running in the trough or table *g,* and the wool is delivered upon the main cylinder by means of the cylinders *h*, *h*, where it is scribbled or carded as usual, and taken off in slivers or bands by means of the three doffer cylinders A, B, C, which are furnished with narrow strips or fillets of cards for this purpose; the bands or slivers of wool are further advanced by means of the doffer strippers *i*, *i*, *i*, being passed between the guides *j*, *j*, in order to keep the fibres of the bands separate, and also passed through the twisting tubes *k*, *l*, *m*; these twisting tubes are caused to revolve by means of the endless straps *n*, *n*, *n*, running between them and the guide rollers *o*, *o*, *o*, for the purpose of giving a slight twist to the rovings as they pass between the drawing rollers *p*, in order to be wound on to the bobbins or spools *q*, *q*, mounted in the bobbin frame *r*, *r*.

The slivers or threads are wound upon the spools, side by side, by means of the revolution of the single worm *s*, driving the guide bars *t*, *t*, backwards and forwards a short traverse, and thus laying the slivers evenly, side by side, upon the bobbin.

Another mode of putting in this slight twist to the rovings, is by passing the slivers between a double endless strap or belt, exactly in a similiar manner as that described in the specification of a patent for improvements in spinning, granted to William Garnett, the nineteenth day of June, one thousand eight hundred and thirty eight, and which was duly inrolled in the office of the Rolls Chapel. This method is explained with reference to the detached fig. 4. The drawing rollers *p*, are the same as in figs. 1, 2, and 3, and the double endless straps *u*, *u*, for giving twist to the rovings, are shewn in place of the twisting tubes, immediately behind the drawing rollers.

It will be perceived that small weight rollers *v*, run loosely upon the upper strap, and that between every two or four rovings or slivers there is a thin plate of metal *w*, the thickness of the required roving, for the purpose of equalizing the distance between the running straps throughout, and causing an equal amount of pressure upon all the rovings.

The spools *q*, *q*, with the finished slivers, are now ready to be taken and placed in the spinning machinery, at once, from the third carder or finisher, without any further preparation.

Having thus particularly described these improvements in machinery or apparatus for carding cotton, flax, wool, or any other fibrous substances, I desire it to be particularly understood, that I claim the new and particular arrangement of such machinery as far as the novel methods of feeding, carding, and doffing have been explained, that is:—Firstly, dividing the machinery for carding into three or more parts, and drawing the slivers or produce of the first and second carders into one, for the purpose of equalizing the sliver before it is put into "the finisher" or third carding engine, which drawing down of the slivers may be performed upon the two carders, one or more times, according to the fineness of the rovings required: Secondly, the application of three or more doffers, with the guides *j*, *j*, *j*, to the carding engine, for the purposes above explained,—*three* being the number I prefer; and lastly, the small plates of metal, or other material, to be placed between the endless belts or straps (where they are used in the place of twisting tubes) alternately with the rovings, in order to equalize the slivers by preserving the uniformity of the inner surfaces of the twisting straps or belts. —[*Inrolled in the Rolls Chapel Office, July*, 1838.]

Specification drawn by Messrs. Newton and Berry.

To Edwin Whele, *of Walsall, in the county of Stafford, tallow chandler, for his invention of an improvement or improvements in the manufacture of candles.*—[Sealed 1st August, 1838.]

The subject of this invention is a machine or apparatus for dipping the wicks of candles into the vat of melted tallow, for the purpose of facilitating that operation which has been heretofore most commonly practised by hand. There have, however, been many mechanical contrivances suggested for this, though perhaps but little known; the present, therefore, can only be considered as some variation from or improvement upon what has been done before. We should feel gratified in being able to point out precisely what the present features of novelty are, but the manner in which the specification is drawn up does not afford us that facility.

There are in the drawings representations of parts of the apparatus; but no one figure by which we could arrange the whole, so as to arrive at a distinct conception of the manner in which the machine is intended to act in producing the candles.

If we understand right, a great number of horizontal rods, holding the pendant wicks, are to be placed in a frame, of which frames there are to be several in one machine, and these frames are capable of being moved up and down by wheels and pinions, driven by a winch, but for what purpose we do not perceive; they are also to be raised sideways, and are by some means to be transferred and attached to a lever, by which they are to be suspended over a pan of melted tallow. By the action of a treadle, this lever is to be worked up and down for the purpose of causing the wicks to dip into the melted tallow in the pan, and to be raised up to cool. There is also a sliding board made to pass under the candles when they rise out of the pan to take off the drippings; and a scale and weight is placed at the reverse end of the vibrating lever, for the purpose of shewing when the candles have acquired sufficient a weight of tallow.

One figure in the drawings shews a modification of the invention, in which a machine appears to be intended to carry several frames of wicks, revolving upon an axle; but we can give no definite account of what the invention really consists.—[*Inrolled in the Petty Bag Office, January* 1839.]

To AUGUSTUS APPLEGATH, *of Crayford, in the county of Kent, calico printer, for his invention of certain improvements in letter-press and block printing, and in the machinery or apparatus used for the same.*—[Sealed 8th July, 1833.]

THERE are two features in this invention,—the first applies to printing from types, called letter-press work; the second to printing from blocks on fabrics, such as calico and silk.

In printing letter-press, for book-work, the lines of type are formed into pages, technically called imposing, and these pages (or it may be stereotype blocks) are usually arranged within a nearly square frame of iron, called the chase, which, with the pages of type so arranged, is then called the form, having four pages in breadth and two in depth, to constitute an octavo sheet. When these forms are printed in a machine, worked with a pressing cylinder, the table of types has to travel under the pressing cylinder through a space equal to the depth of the two pages, which the patentee considers to be an unnecessary extent of action; therefore, in order to reduce the length of the table of the machine, and contract the extent of its movement, it is proposed to place all the pages of type, side by side, in long narrow frames, (chases,) so that the form shall have eight pages in breadth and only one in depth. By this arrangement of the types or blocks, the machine may be reduced in length, and the table be required to move only half the ordinary distance.

For the purpose of printing both sides of the paper, the sheet is to be carried through the machine by tapes, in the usual way, but by a peculiar arrangement of the conducting rollers.

The second feature of the invention, is a mode of printing two or more colours, at one operation, upon calico or other fabric, which is effected by forming certain portions of the pattern by surfaces of felt upon one printing roller, and the counter-parts, or other portions of the pattern, by pieces of felt upon other distinct printing rollers, which, severally receiving their respective colouring matters from separate colour boxes, are made, by their rotary motions, to bring all the parts of the pattern or colours of the design into their proper situations upon the fabric, at the time that the impression is given.

In the event of the required pattern or design consisting of many colours, there must be a distinct felted roller for each; and for the purpose of bringing these portions of the pattern severally into their proper positions, it is proposed to work the respective rollers by some convenient construction of interrupted gear machinery, so that they may come into operation at intervals.—[*Inrolled in the Inrolment Office, January*, 1834.]

To John Scott Russell, *of Stafford-street, in the city of Edinburgh, M. A., for certain improvements in the construction of vessels for sustaining the pressure of fluids; and in the boilers and machinery of steam engines; and in the manner of their application to locomotive purposes.*—[Sealed 14th August, 1833.]

The subjects of this patent are described under four heads:—First, a mode of giving strength to vessels of slight structure, designed to contain expansive fluids; second, the adaptation of such vessels as the boilers for steam engines; third, a peculiar arrangement of the openings and slide valves for effecting the induction and eduction of the steam; and fourth, a mode of connecting locomotive engines to the wheels on which they run.

The vessels intended to contain elastic vapour are made of thin plates of iron connected in rectangular forms, and for the purpose of giving rigidity and support to the thin plates, they are braced together by a multitude of internal rods, placed longitudinally, transversely, and perpendicularly through the vessel, and secured by nuts and screws on the outside.

From the great strength obtained by this construction, such vessels are considered to be peculiarly eligible for the boilers of locomotive steam engines, as they may be made much lighter than those of ordinary use.

The orifices into the working cylinder, by which the steam is admitted and discharged, are proposed to be made at some distance apart from each other, and to be opened and closed by sliding valves, which are made to act simultaneously through the agency of bent levers and sliding rods, connected to the moving parts of the engine.

The bearings by which the locomotive engine is supported and connected to the running wheels of its carriage, are inserted into vibrating strap-levers, mounted on bent springs, placed on the sides of the carriage, so that any jolts to which the carriage may be subjected by passing over irregular surfaces, will be neutralized by the vibrating action of the strap-levers and the springs.—[*Inrolled in the Inrolment Office, February,* 1834.]

To RICHARD BRIGHT, *of Bruton-street, Berkeley-square, in the county of Middlesex, lamp manufacturer, for his invention of a new or improved apparatus or contrivance for effecting the more complete combustion of candles, and superseding the necessity of snuffing.*—[Sealed 13th January, 1838.]

THE object of this invention is to conduct the end of the ignited wick of a candle out of its perpendicular direction, so as to cause the snuff to pass through the side of the flame, in order that by becoming exposed to the atmosphere, the burnt wick may moulder away, and not require snuffing.

This object has been effected, for some years past, in Palmer's patent candles, by twisting spirally two or more wicks together in the form of the threads of a screw; but in the present invention the wicks are made straight as in an ordinary flat candle, and the ignited ends are caused to bend from the perpendicular by passing through a small apparatus placed on the top of the candle, which has trumpet mouths inclining outwards.

The contrivance is shewn in Plate XX., at fig. 1, consisting of three trumpet tubes *a*, *a*, *a*, connected by fastenings *b*, *b*, to a ring *c*, which ring is intended to rest upon a ledge made for that purpose in the upper part of the candlestick.

In this instance the candle is intended to be enclosed in a cylindrical tube, and to be forced upwards, as it burns away, by a worm spring below, in the same way as the candles are usually raised in carriage lamps,—a flange at top of the tube preventing the candle from being forced out of the cylinder. The top end of each wick is then passed through its trumpet tube, and being by that means bent off to the side, the snuff passes out at the side of the flame and moulders away.

In adapting this contrivance to a naked candle, that is, without enclosing the candle in a stationary tube, and raising it by a spring, it is proposed to attach the trumpets to a cap-piece, which is to be placed on the top of the candle, when, by pendant weights, the cap-piece, with the trumpets, will gradually descend as the candle burns, and the burnt ends of the wicks will be conducted off through the flame, as before described.—[*Inrolled in the Inrolment Office, July,* 1839.]

To THOMAS NICHOLAS RAPER, *of Bridge-street, Blackfriars, gentleman, for improvements in rendering fabrics and leather waterproof.*—[Sealed 20th July, 1839.]

THE mode proposed by the patentee of rendering woollen and other fibrous goods and leather waterproof, is by immersing them in certain chemical solutions,—by which he says the goods will be made impervious to water, without causing them to impede the free passage of air, or perspiration, or emitting any unpleasant odour.

It is proposed that four different liquors be prepared, in which the goods are to be successively steeped, and being afterwards dried, will be found to have acquired the property of being waterproof.

The first liquor is directed to be made by dissolving one ounce of good gelatine in a quart of hot water, to which is to be then added one and a half drachms of carbonate of ammonia, or half a drachm of liquid ammonia. The second liquor is to be a strongly concentrated solution of sulphate of soda, sulphate of potash, sulphate of ammonia, or phosphate of soda. The third is to be a solution of acetate of lead. The fourth is to be made by titurating four pounds of fullers earth, with half a pound of camphor in powder, which is to be mixed in forty gallons of pure or distilled water, and after being well stirred, it is to be drawn off into a bath before the finer particles have subsided.

In the first of these liquors the goods are to be immersed for some time, (how long is not said,) and after being removed and dried, they are to be immersed successively in the other three liquors, and then washed and dried, when they may be dressed and pressed in the ordinary way.

The patentee says, that very beneficial effects may be produced upon the goods by these means, even if steeping in the first and fourth solution be omitted, and that he does not intend to confine himself to the proportions or the use of the salts above mentioned; but that he claims the exclusive right of operating in this way upon fabrics and leather, for the purpose of rendering them waterproof.—[*Inrolled in the Inrolment Office, January,* 1840.]

To WILLIAM GOSSAGE, *of Stoke Prior, in the county of Worcester, manufacturing chemist, for his invention of certain improvements in manufacturing iron.*—[Sealed 18th June, 1838.]

THE method of converting pig or crude iron into malleable iron, by first melting the pig or crude iron in a furnace, called a "finery," and separating a considerable portion of the earthy impurities contained in such iron, and afterwards submitting the iron to the process called "puddling," and subsequently to the operation called "shingling," is well known.

It is also known to manufacturers of malleable iron, that during the operation called "shingling," as conducted in the above-mentioned method of converting pig or crude iron into malleable iron, a large quantity of black scoria, which is technically called "hammer slag," is separated from the metallic iron; and that this hammer slag consists of iron combined with oxygen, and is nearly free from earthy matter.

An improvement upon the above-mentioned method of converting pig or crude iron into malleable iron has been adapted, which improvement consists in using the hammer slag, obtained as before described, for the purpose of purifying pig or crude iron, and converting such iron into malleable iron by the operation called puddling, without the previous application of the finery process.

In working according to this improvement, hammer slag is put into the puddling furnace with pig or crude iron, in the first instance, and the operation of puddling then proceeds, according to a method well known; during which operation, a boiling up or effervescence takes place, and the earthy impurities become fluxed into cinder, which separates from the iron.

After the operation, called puddling, has been completed, the iron which has been separated is submitted to the process called shingling, in the same manner as is practised in working upon the old method, and a black scoria, which is also called hammer slag, is thereby separated from it; which hammer slag consists of iron combined with oxygen, but it also contains a considerable portion of earthy matters, which render this hammer slag unfit to be used for purifying pig or crude iron in the puddling furnace.

The manufacturer is therefore obliged to continue the finery process in part, in order to obtain hammer slag, of suitable quality, to be used for purifying pig or crude iron, in the puddling furnace, in the first instance.

I consider that the action of the hammer slag, used in the puddling furnace, as herein referred to, consists in furnishing oxygen, which disengages the carbon contained in the pig or crude iron, and in supplying oxide of iron, which, combining with earthy impurities contained in such pig or crude iron, forms the fusible compound called cinder.

One of the objects of my invention is to supply a cheap material, to be used as a substitute for hammer slag in puddling pig or crude iron. For this purpose I use the common argillaceous iron-stone, which is found generally in the coal districts of this country. This material contains oxide of iron, combined with carbonic acid, and by roasting or calcining it, in the ordinary method, I convert the carbonate of iron, which it contains, into oxide of iron, and render the stone capable of being more easily reduced to powder. I then powder the calcined stone, and when this is powdered, it may be applied alone to the pig or crude iron in the puddling furnaces; but I prefer to mix the powdered stone with lime, in powder, either in the state of quick-lime or in the state of carbonate of lime.

The quantities of materials I usually employ for 450 pounds of pig or crude iron, of average quality, are 30 pounds of calcined iron-stone, and five pounds of slacked lime. I introduce the mixed powder into the puddling furnace, at the same time as the pig or crude iron, closing the damper of the furnace to prevent the powdery materials being carried off by the chimney draft. I then conduct the operation of puddling in the same manner as when hammer slag is employed.

As argillaceous iron-stone varies in the proportions of earthy matter and oxide of iron, which it contains, so the quantity of this stone, required for purifying a given weight of pig or crude iron, will consequently vary. I find the proportions which I have stated suitable when the iron-stone, which I use, contains from 40 to 50 per cent. of oxide of iron, and when this is applied to pig or crude iron of fair average quality. The proportion of lime required will vary according to the proportion of earthy matter contained in the pig or crude iron, and iron-stone respectively; but, as it is not customary for manufacturers of iron to investigate, with accuracy, the constitution of the pig or crude iron, or other materials which they employ, the most convenient mode will be to judge of the suitable proportions of iron-stone and lime by the progress of the operations. If the workman finds that the cinder produced does not become sufficiently fluid to separate freely from the malleable iron, he should increase the proportion of lime employed; and if the boiling up or effervescence, which occurs during the puddling, is not sufficient, he should increase the proportion of iron-stone employed; but it will be understood that these last-mentioned directions are intended to apply only to subsequent operations, and that it will not be necessary, in any instance, to vary the proportions of any of the ingredients employed after the operation of puddling has been commenced.

My improvements, in the manufacture of iron, also consist in the construction of a more durable sole for the furnaces employed in the operation of puddling. In the furnaces usually employed for this purpose, the sole is a plate of cast iron, which is protected from the action of the fire by hammer slag and iron scale; but, instead of a sole of cast iron, which requires this protection, I use a sole of such grit stone as possesses the quality of resisting the action of fire. The stone which is usually employed for forming the hearths of iron smelting furnaces is suitable for the above purpose. I make this sole with either one entire block of stone, or with several blocks fitted together without cement.

I construct the sole in a form similar to that of the puddling furnaces now in use, to provide for running off the cinder, and I cause it to be sufficiently dished or hollowed out to retain the cinder without allowing it to come in contact with the walls of the furnace. I prefer that the sole should not be less than nine inches thick in any part; and as the furnaces will be similar to those now in use, in all respects, except as above described, I do not consider it necessary to give any further description of them.

The qualities required in the material used for constructing the furnace sole, according to my improvements, are a capability of enduring the action of fire, and such compactness and hardness as will best resist the chemical action of the fluxes to which the sole will be exposed in puddling iron, and which qualities are found in the grit stones used for the hearth stones in blast furnaces.

Having now described the nature of my said improvements, and the mode of carrying the same into effect, I claim, as my invention, the use of argillaceous iron-stone in the conversion of pig or crude iron into malleable iron, by the process called puddling, whether this argillaceous iron-stone be used with lime or other fluxing materials, or be used alone. And I claim the use of lime as a fluxing material, when used with any kind of iron-stone, or oxide of iron, in the conversion of pig or crude iron into malleable iron, by the process called puddling. And I claim, lastly, the use of such kind of stone, as I have herein described, for constructing the soles of furnaces for puddling iron.—[*Inrolled in the Rolls Chapel Office.*

To Christopher Robinson, *of Athlone, in the county of Roscommon, Ireland, for his invention of certain new or improved machinery for transferring caloric from aeriformed or fluid bodies to other bodies of the like description, and applicable to other useful purposes.*—[Sealed 2nd May, 1833.]

The intention of the patentee is to construct a refrigerating apparatus, which shall cool and condense any heated vapour passed through it, and at the same time transmit the caloric to any other fluid with which it may be in contact.

The title of the patent states improved machinery,—we perceive no machinery described in the specification, but only some very imperfectly drawn-out lines, which appear to be intended to represent a series of pipes, the end of one being connected to the commencement of another, and carried on in a zigzag consecutive range, which pipes are to be surrounded by a bath of cold water.

The patentee does not intend to confine himself to the condensation of steam by these means, but claims it for the cooling of all kinds of vapours or fluids, and for transmitting the heat to the vapour or fluid in which the pipes are immersed.

He claims the apparatus described, but neither this, (as far as we can understand it,) nor the mode of effecting the object, has the smallest feature of novelty.—[*Inrolled in the Petty Bag Office, November,* 1833.]

Scientific Adjudication.

COURT OF QUEEN'S BENCH.

[Sittings before Lord DENMAN, and Special Juries.]

* CLARIDGE *v.* LATRADE.

Sir F. Pollock, Mr. Kelly, Sir William Follett, and another gentleman appeared for the plaintiff, and the Attorney-General, Mr. Platt, and Mr. Robinson for the defendant.

This was an action for the alleged infringement of a patent, obtained by the plaintiff for the introduction into this country of the use of bitumen, in the making of pavement. The defendant pleaded first, not guilty; secondly, that the alleged invention was not new; thirdly, that the specification was not sufficient; and fourthly, that the shares in the patent had been assigned to more than twelve persons, and consequently the patent was void in law. The patent in question was dated on the 25th of November, 1837, and the specification was dated on the 25th of the following May. The footway between Whitehall-place and the entrance to Privy-gardens, was, in the spring of 1838, laid with the composition prepared by the plantiff; and the steps leading from Carlton-terrace to St. James's park, and the space round the Duke of York's column, were afterwards formed of the same composition.

Sir F. Pollock, in stating the case to the jury, said that his client had introduced into this country the employment which had been found very serviceable abroad. For such an introduction he was entitled to a patent, that being the mode adopted to remunerate those who made, or those who first gave to the country the benefit of scientific discoveries. The patent right had been invaded by the defendant, who imitated the process employed by the plantiff. The defence set up was, that the use of this bitumen was not new. It might be found that in some scientific works the capacity of bitumen to be employed for its present purposes might be asserted; but to the person who first reduced these vague theories into profitable practice, the honour and the profit of the invention were due. That was the case with his client, and he expected from the jury a verdict securing him in the advantage to which he had fairly entitled himself.

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* For copy of Claridge's Specification, see vol. 12, page 226, of our present Series.

Joseph Toogood, the surveyor to the commissioners for paving Whitehall and Regent-street, proved the laying down of the pavement near Whitehall under the personal superintendence of the plaintiff, and the witness stated that the process was quite new to him and was very useful. The preparation was impervious to water, It was incorruptible by air and impenetrable to water [a laugh].

The Attorney-General, referring to Johnson's dictionary, said that it was old enough, for the walls of Babylon were built with it [a laugh].

Sir F. Pollock asked the witness whether he was acquainted with the walls of Babylon?

The witness answered that he had long been expecting to go there, but had been disappointed.

James Carew, who had been employed in laying down the pavement near Whitehall, but had afterwards been in the service of the defendant, proved that the defendant used the same sort of asphalte rock as that used by the plantiff, but the defendant said that it was brought from the Val de Travers. The process of preparation was precisely the same in both cases. At first defendant used mineral pitch, as plantiff did; but afterwards, when he could get no more mineral pitch, he used Stockholm tar. What was laid down in Oxford-street consisted of one-third mineral pitch. In cross-examination, this witness said that he was in the service of "Claridge's Asphalte Company," not of the plaintiff alone.

François Rosser, a Frenchman, who had been employed on the pavement near Whitehall, gave similar evidence. In cross-examination, he said that the sort of pavement had been used some years ago in Paris—as early as 1825. That recently the Boulevards, the Place de la Concorde, and the Pont Royal had been paved with it, and that it was now applied to the Champs Elysees.

Mr. Cooper, a lecturer on chemistry, proved that he had analysed the asphalte of Seyssel on two different occasions. Two years ago it gave 7 per cent. of bitumen, and the remainder carbonate of lime; but upon a more recent analysis the result was 10 per cent. of bitumen and the remainder carbonate of lime. He had analysed Norway pitch. If that was heated to a considerable extent it lost some portion of volatile matter, which was commonly called oil of tar, and the pitch became indurated. If subjected to the action of heat, it lost 24 per cent. of its weight, and the remainder was a firm, hard pitch. Norway pitch was not the same as Stockholm tar, of which, when heated, there passed off 62 per cent., leaving 38 per cent. of hard pitch. The analysis of Val de Travers rock gave the same result as that of Seyssel. When Stockholm tar was united with asphalte of Seyssel, it made a substance similar to that of Bastenne tar.

Cross-examined: The specimens were sent to the witness from the works of Claridge and Co. The heat required was between 200 and 300 degrees. The volatile matter then went off, and left a brittle pitch behind. If pitch had sufficient volatile matter present to let the substance flow, it might be called tar, otherwise not; that volatile matter was not petroleum; petroleum was a natural production—it was rock oil; coal bitumen was a different substance.

Mr. Phillips: The curator of the government Geological Museum said that he had devoted his life to the study of chemistry. He had seen the specification in this case, and believed the discovery to be new and useful. The definitions given by Mr. Cooper were correct.

The Attorney-General, for the defendant, contended that this was not a new invention. It had frequently been described in books; in the old "Dictionary of Commerce," by Postlethwayt; in the modern "Dictionary of Commerce," by Mr. Maculloch, published in 1834; in "Savary's Dictionary of Trade;" and in the "Encyclopædia Britannica," and other works, the use of asphalte for the various purposes to which it was now applied, was set forth. The process therefore, was not new. But, secondly, asphalte was compounded of different materials, and the defendant's combination was superior to that of the plaintiff, for he used tar instead of pitch, as the other materials which he combined with it were of a different sort. So that even if the plaintiff had introduced the use of one sort of asphalte, that would not give him a right to maintain the action against the defendant for using another sort. That was a second point of the defence. The other was, that the patent had been assigned to more than twelve persons, and was, therefore, void in law; but that might rather be a question for the court than for the jury. He should prove, first, that the process was not new, and, secondly, that the defendant had not copied from the plantiff, but had introduced one of his own, and that would entitle the defendant to a verdict.

Dr. Andrew Ure, (the author of the "Dictionary of Manufactures"), said that the combination of bitumen with the carbonate of lime, for the purpose of producing a hard and solid substance, impervious to wet, had been known for a long time. It had been used above two years ago at Broadstairs. A combination of pitch with sand had also been used. Tessera, too, was common in Scotland; that meant coverings for houses. In his opinion the plaintiff's specification was not sufficiently precise. It did not intimate whether tar was to be used. Tar mixed better than pitch with the asphalte of the Val de Travers. That asphalte had more pitch in it than any other asphalte.

Mr. H. Harrison had known for the last twenty years a cement called Lord Stanhope's, made on the same principle as the plaintiff's, and used for terraces and roofs.

Professor Brande gave similar evidence.

Mr. G. B. Lennard was then called, and proved that the plantiff had transferred to certain persons the exclusive license to use the patent in this country.

The conveyance appeared to be made to seven persons, as trustees for the company.

Sir F. Pollock replied.

Lord Denman having summed up, the jury returned a verdict for the plantiff on all the issues of fact, but for the defendant upon the question as to the right to grant a license to more than twelve persons, with liberty to the plaintiff to move to enter the verdict on last issue for plaintiff.

COURT OF COMMON PLEAS.

* CRANE *v.* PRICE AND OTHERS.

Sir F. Pollock, Mr. Richards, and Mr. Smith, were counsel for the plaintiff; and the Solicitor-General, Mr. Serjeant Bompas, and Mr. Rotch for the defendants.

This was an action brought by the plaintiff, who is the proprietor of iron-works near Swansea, against the defendants, for an alleged infringement of a patent.

The patent in question was taken out for an alleged improvement in the smelting or manufacturing of iron from ironstone, by combining the use of anthracite or stone coal and culm with hot air blast. The principal ground of defence was, that the invention was not new. The trial occupied the Court during the whole of the day, and was adjourned at its rising to the following day.—The trial of this cause was resumed on Wednesday. The plantiff's case lasted until past three.

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* For description of Mr. Crane's invention, see vol. 11, page 344, of our present Series.

The Solicitor-General then addressed the jury for the defendants, contending that the alleged improvement, for which the plaintiff had taken out a patent, was merely the application of Mr. Neilson's invention of the hot-air blast to common stone coal, as it might be applied to any other species of fuel, and gave him, therefore, no patent right whatever.—After the learned counsel had proceeded for some time in his address,

The Lord Chief Justice suggested that as the question was one rather of law than of fact, the better way would be to turn it into a special case.

To this the counsel on both sides agreed, and accordingly a verdict was taken for the plaintiff *pro forma*, subject to the opinion of the Court above.

Original Communication.

(To the Editor of the London Journal and Repertory of Arts, &c.)

COLLINGWORTH MILLS,
NEAR BRADFORD, YORKSHIRE,
February 1st, 1840.

SIR,—Having been a subscriber to your Journal for the last seven years, I should have written frequently during that time, either to state an opinion, desire explanation, or complain that you do not give sufficient prominence in your admirable publication to the inventions affecting the industry of this neighbourhood,—the Worsted Manufacture.

The high postage charge, hitherto, has tended to discourage letter-writing. Now that your readers may correspond with yon, at the expense of a penny, you may appropriate an extra page to admit their correspondence; whether you do so or not, you must, at least, exercise a little extra patience. I fear the present communication will not be fit for the former, but will require the latter.

I beg to thank you for the important information, frequently communicated in the "Scientific Notices," especially in reference to the steam engine and boilers, the properties of coal, the laws of heat, &c. in which our manufactures are deeply interested. I was pleased with the correct practical remarks of Mr. Parkes, on steam boilers, given in the number for January, page 311.

Every person of experience, possessing discrimination and scientific knowledge, sufficient to enable him to make observation, and to distinguish between real and apparent differences, will hold that *thin metal*, a *slow draught*, *extensive heating* surface, as compared with the *power* of the *engine*, the direction and capacity of the flues, and the proper regulation as to time and quantity of feeding the boilers with water, are all of the utmost importance, in order to effect economy of fuel, and durability of the boiler and furnace.

I have reason to believe that the boilers made by Boulton and Watt are made of thin metal, chiefly, because of the greater economy of fuel; though it is necessary that the pressure of the steam in the boiler should be limited to three pounds per square inch.

But how can we get over the difficulty raised by Dr. Ure's experiment with two small vessels placed in a sand bath, to which Mr. Parkes refers?—In my opinion, the attempt to prove principles in operation on a large scale in the arts by such diminitive methods of experiment, generally occasions the greatest differences of opinion. Such experiments may be correct in their results, occasionally, when all the circumstances are precisely similar to apparatus on a large scale; but, not unfrequently, the inferences drawn from them prove fallacious, and lead to the most mischievous consequences.

In Dr. Ure's experiment, I would object to the use of a sand bath, if it were for no other reason than that it is different to the medium by which heat is imparted to a steam boiler of the *common* construction. The surface of the vessel should be *ex-*

posed to the *fire*, or to the *hot air*, *vapours*, and *flame*, *proceeding from it.*

Sand transmits heat slowly.—If, therefore, the thicker vessel should have imbibed a larger quantity of heat than the thinner one, *previous* to the water being admitted, it will communicate more heat to the water, in a given time, than the thinner vessel. The thinner vessel will be sooner exhausted of its heat, and the supply, instead of being kept up at the rate of evaporation by *immediate* contact with the source of heat, is cut off by the *interposition* of a *non-conducting* substance.

Either the assumed fact attempted to be established by this experiment is false, or there is an end to all the practical uses of the theory of the transmission of heat.

Steam carries away heat.—If heat be confined, it cannot be carried away by the formation of vapour or steam.—If only partially confined, then it can be carried off only in proportion to the rate of transmission, which is less rapid, as the thickness of the substance is increased through which it has to pass; else, why do we endeavour to confine the heat in our flues by *increasing* the *thickness* of their *external* walls. The *material* of the wall is a *conductor* of heat as well as iron, the only difference being that it transmits heat more *slowly* than iron. Therefore a vessel, composed of thick metal, must transmit less heat, and generate less steam, in a given time, than a vessel composed of thinner metal.

If you think these remarks fit for insertion in your Journal, you are at full liberty to make such use of them. They may elicit observations, on so important a subject, from others more able than

Your humble Reader,
J. H.

We feel obliged by the communication of J. H., and shall be happy to hear from him again, or from any of his friends.—The pages of our Journal are open to the reception of all useful discussions on subjects connected with practical science, and to notices of all improvements in the various branches of Manufactures and the Arts. Though some class of subjects may have appeared to us of peculiar importance, and have assumed in our pages more prominent positions than others, we have never intentionally slighted any.

It will, however, be a source of much satisfaction to us to receive occasional hints from our readers on such matters as may lead to improve our work, and render it more extensively useful; and it would be further gratifying to us to be favoured with such occasional information and assistance from correspondents, as the wide range of our manufactures prevent us from obtaining, as often as we could wish, by personal observation.—Ed. L. J.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

June 11, 1839.

James Simpson, Esq. in the Chair.

"Experimental Researches upon the cost of Light afforded by different Lamps and Candles."

By Andrew Ure, M.D., F.R.S., &c. &c.

The author having instituted a series of experiments to determine the advantages of Mr. Parker's new hot oil lamp, adopts as the standard of comparison, the French mechanical lamp, in which the oil is raised by machinery, so as continually to overflow at the bottom of the burning wick. The relative illumination was determined by the well-known method of the equal intensity of shadows, and verified by that adopted by Professor Wheatson, namely, by the relative brightness of the opposite sides of a revolving ball.

One peculiar feature of the new lamp is its bell-mouthed glass chimney, above which is a chimney of iron, with a parted diaphragm for the purpose of causing a certain portion of the heat of the flame to reverberate against the interior cylindric cavity of the oil cistern. The bell mouth is formed in a mould, and is far better suited for producing a steady flame than the rectangularly contracted chimney of the mechanical lamp. The intensity of the shadows from the mechanical lamp and the hot oil lamp, of a wire a few inches long and of the thickness of a crow quill, was equal, at a distance of 10 and 11 feet respectively; their relative illuminations being as the squares of these are, as 100 and 121 respectively, and the consumption of the best sperm oil was 15·2 and 11·6 grains per minute; the relative cost of illumination for this oil would thus appear to be 50 per cent. in favour of the new lamp. On trying Southern whale oil the cost of illumination appeared to be about one-third that of the mechanical, and one-half that of the hot oil lamp with sperm oil. The author tried many other substances, and, comparing the various illuminations, concludes that the hot oil lamp with Southern whale oil affords an economy of light nearly 12 times greater than stearine or German wax candles, 7½ times greater than tallow mould, 11 times greater than cocoa nut, 8½ times greater than Palmer's, 17½ times greater than spermaceti, and 18 times greater than wax candles.

The author had also compared the illumination produced by one of the Fresnel Lamps deposited at the Trinity House. The lamp consists of four concentric circular wicks, placed in a horizontal plane, the innermost being $\frac{7}{8}$ths of an inch, and the outermost 3½ inches in diameter. The intensity of the shadows from this and the mechanical lamp were equal at a distance of 13 feet 3 inches, and 4 feet 6 inches respectively; taking the squares of these the Fresnel lamp gives about nine times the light of the mechanical, which latter may be assumed as equal to that of eleven average wax candles. On comparing one of the best Argand lamps with the mechanical, the former was to the latter 10 to 11; so that the illumination of the Fresnel lamp, instead of being as has been asserted, equal to 40 Argand lamps, is not equal to more than 9·6 of those lamps. In the Bude light a small stream of oxygen is sent up through a small tube within the burning wick, which is $\frac{5}{8}$ths of an inch in diameter, and the flame about $\frac{3}{8}$ths of an inch. The illuminating power is equal to about 30 wax candles. Dr. Ure also examined the illuminating power of different kinds of wax candles, and found that the light from a long-three and a short-three was the same, or $\frac{1}{11}$th of the mechanical lamp; also the light emitted from one of the six-to-the-pound was very little less, being $\frac{1}{12}$th of that of the mechanical lamp. The consumption of wax in a long or short-three may be taken at 126 grains per hour, and in a short-six at 125 grains per hour.

Wax contains 81·75 parts of carbon in every 100 parts, and the combustion of these 100 parts produced 36 parts of carbonic acid; consequently, a wax candle will generate per hour about 375 grains of carbonic acid. or 800 cubic inches of gas. Now an average-sized man developes and exhales from his lungs 1632 cubic inches of gas per hour; thus the combustion of two ordinary wax lights deteriorates the air to about the same extent as the breathing of one man.

Dr. Ure detailed some experiments to which he had been led for determining the fluidity of different liquids by ascertaining the time in which a given quantity of liquid would run off through a syphon. The results were very curious: the syphon was $\frac{1}{8}$th of an inch in diameter, and the times which were occupied in running off by equal measures of naptha and alcohol, each weighing about 200 grains, were 80 and 120 seconds respectively, The same measure of sperm oil, at the ordinary temperature, took 2700 seconds, but when heated to 265° F. it only took 300 seconds. Southern whale oil took the same times at the same temperatures.

June 18, 1839.

The President in the Chair.

"An Account of the New Stone Bridge, over the River Lea, at Stratford-le-Bow."

By John Buldry Redman, Grad. Inst. C. E.

The old bridge, of which a full account by Mr. Burges is published in the Transactions of the Antiquarian Society, was perhaps the most ancient arched stone bridge in England, having been erected by order of Maud, the queen of the first Henry (A.D. 1125). The construction of this bridge and the alterations which had been made in it from time to time, are fully described and illustrated. This bridge being found exceedingly inconvenient both for the traffic and the navigation, in 1818 Mr. Walker recommended a plan for a new stone bridge, for which an act was obtained in 1834, and the work commenced in April 1835. The progress of this work is the subject of this communication. The temporary bridge, the construction of which is accurately detailed, being finished, the removal of the old bridge was proceeded with, the arches thereof being supported by proper centering. The arch stones being laid bare, the old roadway was discovered—the ruts of the wheels and the track of horses and cattle being distinctly visible; the ruts were worn in some places to within 3 or 4 inches of the intrados, and in others quite through.

The new bridge is of Aberdeen granite, and consists of a single elliptical arch, 64 feet span on the square line and 66 feet on the skew, with a curved line of 13 feet 9½ inches, the faces of the abutments making an angle of 70° 45′ with the face of the arch. The width of the bridge is 40 feet within the parapets. The progress of the work, the construction of the temporary bridges and of the coffre dams, and the laying of the foundations, are described in great detail and illustrated by drawings. The first course of footings was bedded upon concrete of 12 inches in thickness, composed of eight measures of river gravel and sand to one of lime. The lime was brought hot to the work, and being ground was mixed dry with the sand and gravel. Water being then added, the whole was thrown in from the level of the strutting pieces of the coffre dam, a height of 10 or 12 feet. The first six courses were faced with puozzolana mortar, composed of one and a half measure of sand, one of puozzolana, and one of lime.

The author fully details the construction of the centering and the dimensions of the timbers, the formation of the arch and templates of the arch-stones. The centering was eased on the forty-first day after the arch was keyed, and struck on the forty-second day; the arch subsided one inch during the erection of the work, and half an inch after first easing the centering; two inches having been allowed for the whole subsidence. The arch being completed, the abutments and wing walls were brought up to their proper level, and the cornice and parapets added; the crown of the arch and top of the abutments were covered with concrete, 1 foot 6 inches thick, upon which the foot-paths of Aberdeen granite and the roadway of screened gravel are laid. The approaches are bounded by retaining walls, as shewn in the drawings. The bridge was opened on the 14th of February, 1839, three years and ten months from the commencement of the operation.

The communication is accompanied by seven sheets of drawings, having the old, new, and temporary bridges, and their various parts, in elevation, plan, and section, with all the dimensions, accurately laid down.

" A new plan of construction of Sliding Gates for the Entrance Locks of Docks, &c."

By J. C. Singels, Engineer of the Waterstaat, Hollande, &c. &c.

The improvement suggested consists in substituting for the ordinary Lock Gates, Sliding Gates, traversing the ends of the lock on rails laid on sills, drawn across by chains and capstans.

The author in proposing this mode of construction assumes, that when a lock exceeds 50 feet in width, ordinary gates must be abandoned and caissons used. The advantages offered by it are, diminishing the length of the lock by that of the ordinary opening gate, consequently the volume of water to fill the lock is lessened in the same degree, and reducing the number of the locks; for as a small elevation is essential to the strength of the ordinary gates, the sliding gates may on the contrary be made of almost any height without any fear of impairing their strength or solidity.

In the description of the Plans accompanying the paper, great stress is laid on the whole length of the lock, with the exception of that part across which the gate traverses, being constructed on an invert arch, thus giving greater solidity than where a flat floor only is used, either for the whole length, or for the wide space necessary for the ordinary gates to swing upon. It is acknowledged that more masonry is required in this mode of construction, but it is argued that the extra expense will be met by the saving in the length of the lock and in the quantity of the water used.

In constructing the Sliding Gate, the timbers of which are cross braced and strutted, and then covered with planking on both sides, the rule to be observed is, that the thickness of the gate is one-fourth of the width of the lock, so that the main bracing timbers are at an angle of 20°. These are crossed by other timbers, also diagonally braced, extending the vertical height of the gate, so as to give that combination best calculated to withstand the pressure of the water on either side. To obviate the difficulty of setting in motion so heavy a mass as the sliding gate, it is proposed to place within it some barrels filled with air, which by their buoyancy would relieve the rollers of some portion of the weight, and enable the gate to traverse more easily.

Mr. Palmer observed, that the author could hardly be acquainted with the modern practice in constructing locks in this country, as timber had for a long period been but little used in the lock chamber. His practice had been invariably to have an invert arch at a lower level than the lock chamber. He was now constructing at Port Talbot, in South Wales, a lock of 45 feet span, in which there was an invert arch built of stone, 3 feet thick, with lias lime, placed on a stratum of concrete, 2 feet thick, the concrete being composed of four parts of gravel and sand to one of lime; above this invert, the floor was filled in with 2 feet thick of brickwork, laid in Roman cement. Beneath the roller curbs, stones were placed to bed them upon. Each lock gate weighed about 40 tons, one half of which was borne by the heel-post and the other half on the rollers, yet there was no difficulty in moving it at pleasure. The depth of the water was 30 feet, and sometimes the whole column pressed on the gates, yet no injury was feared. There had been great difficulty with the water during the course of construction, but the invert and the side walls placed on it were perfectly sound, and able to withstand any pressure. He apprehended that the sliding gate would be much heavier than the common gate—that the expense of construction would be greater—and he could not discern any compensating benefit to result from its adoption.

June 25, 1839.

John Macneil, Esq. in the Chair.

The following communications were read in part:—

"On Steam Engines, particularly with reference to their consumption of Steam."

By Josiah Parkes, M. Inst. C. E.

"On the Analysis of a portion of the Iron Heel-plate of the Stern-post of the John Bull, Steam Vessel."

By David Mushet, A. Inst. C. E.

The action of sea water had converted the iron into a substance somewhat resembling plumbago. Mr. Mushet, after analysing it, considers this substance, which had been called marine plumbago, to be composed nearly as follows:

Carbonic acid and moisture	20
Protoxyde of iron	35·7
Silt or earthy matter	3·2
Carbon	41·1
	100

"On a method of Dowelling Timber by Iron Dowels and Asphalte." By M. J. Brunel, M. Inst. C. E.

"On the Expansion of Iron and Stone in structures, as shewn by observations on the Southwark and Staines Bridges." By George Rennie, F.R.S. &c. &c.

"A theoretical calculation of the amount of Fuel saved by working Steam expansively." By J. W. Lubbock, Hon. M. Inst. C. E.

The following communications were announced as received:—

"Observations on the efficiency or gross power of Steam exerted on the piston, in relation to the reported duty of Steam Engines in Cornwall at different periods." By John Scott Enys, A. Inst. C. E.

"Specifications and Drawings of the Gas Works at Middlesbro'-on-Tees." By Peter Henderson, A. Inst. C. E.

"On the construction of the Cherbourg Breakwater; with a Drawing." By G. S. Dalrymple.

"Drawing and Description of the Coffre Dam at the new Houses of Parliament." By G. S. Dalrymple.

TELFORD PREMIUMS.

The following Premiums were announced as awarded during the present session:—

A Telford Medal in silver and 20 guineas to John Edward Jones, for his Description, Plan, and Drawings of the Sewage of Westminster.

A Telford Medal in silver to Charles Hood, for his paper on Warming and Ventilating Buildings.

A Telford Medal in silver to Charles Wye Williams, for his paper on the Properties and Application of Turf and Turf Coke.

A Telford Medal in silver to Edward Woods, for his paper on the Forms of Locomotive Engines.

A Telford Medal in bronze and books suitably bound and inscribed, of the value of three guineas, to Frederick Pollock, Lieut. Madras Engineers, for his Description and Drawings of the Coffre Dam at Westminster Bridge.

A Telford Medal in bronze and books suitably bound and inscribed, of the value of three guineas, to R. W. Mylne, for his communication on the Well sunk by the New River Company, at their Reservoir in the Hampstead Road.

A Telford Medal in bronze and books suitably bound and inscribed, of the value of three guineas, to John Buldry Redman, for his Description and Drawings of Bow Bridge.

The Council seized this opportunity of calling attention to the importance of making the Institution the depository of detailed Drawings, Descriptions and Models of works and machinery actually executed; also of professional Books, Papers, and Reports, which are of little value to the individual, but which, when collected and arranged in one place, would be of inestimable value to the Profession. They trusted that all who had such records at their diposal would consider the great service which might thus be rendered to the cause of the advancement of professional knowledge.

The following were announced as subjects for which the COUNCIL of the Institution of Civil Engineers would award Telford Premiums.

1. The Nature and Properties of Steam, especially with reference to the quantity of Water in a given bulk of Steam, in free communication with water at different temperatures.
2. An Account and Drawings of the original construction and present state of the Plymouth Breakwater.
3. The ratio, from actual experiment, of the Velocity, Load, and Power of Locomotive Engines on Railways.
    - 1st. Upon Levels.
    - 2nd. Upon Inclined Planes.
4. Drawings and Description of the Outfall of the King's Scholars' Pond Sewer, and of other principal Outfalls of the Westminster Sewage; also, the inclination, dimensions, and forms of the Sewers, and the observed velocities of water in them.
5. Drawings and Descriptions of the Sewage under the Commission for Regent Street, especially of the Outfall at Scotland Yard.
6. Drawings and Description of the best Machine for describing the profile of a Road, and also for measuring the traction of different roads.
7. The alterations and improvements in Blackfriars Bridge.
8. The explosion of Steam Boilers.—Especially a record

of facts connected with any explosions which have taken place; also, a description, drawings, and details of the boiler, both before and after the explosion.

9. Drawings, Sections, and descriptions of Iron Steam Vessels.
10. The comparative advantages of Iron and Wood, as employed in the construction of Steam Vessels.
11. The advantages and disadvantages of the Hot and Cold Blast in the manufacture of Iron, with statements of the quality and quantity of materials employed, and produce thereof.
12. The causes of and means of preventing the changes in texture and composition which Cast Iron occasionally undergoes when in continued contact with Sea Water.
13. The Properties and Chemical Constitution of the various kinds of Coal.
14. A Memoir of Sir Hugh Middleton, with an Account of his Works.
15. A Memoir of Arthur Woolf, with an Account of his Works.
16. An account of the various methods lately employed for preserving Timber from Dry Rot, and other sources of decay.
17. On the best Gauge for the width of Railways, with the result of the experience furnished by existing Railways.

The Communications must be forwarded to the House of the Institution, No. 25, Great George Street, Westminster, on or before the 31st of March, 1840.

It is not the wish of the Council to confine the TELFORD Premiums to communications on the above subjects; other communications of distinguished merit, and peculiarly deserving some mark of distinction, will be rewarded.

Original Communication.

(To the Editor of the London Journal and Repertory of Arts, &c.)

11, St. Helen's Place, London,
20th January, 1840.

Sir,—Annexed we have the pleasure to hand you the result of an experiment made by us on board the "*Maria*," of applying Steam-power as an auxiliary aid to Shipping, during calm light weather.

From a careful inspection of the "*Maria's*" Log Book, and Captain Black's Memoranda, we find that the Two Ten Horse Engines with which the Ship was fitted, propelled her in a Calm, at the rate of three miles per hour. When the Ship's draught of water, and the smallness of the power employed, are considered, this result of a first experiment, must be deemed by nautical men as very satisfactory. The obstacles to complete success, are of a description easily overcome; and such data have been afforded for further improvements, as experience alone can furnish.

Having at our sole expense fitted this, the first Ship, with Steam-power for occasional use, we shall be happy to afford Her Majesty's Government, the Honourable East India Company, or any Public Body, all the information in our possession on this very important subject. There cannot, we imagine, be any difference of opinion respecting the utility, to all sailing Vessels on distant voyages with Troops, Emigrants, &c., of this partial application of Steam-power: at the same time, it must be obvious, that the repetition of similar undertakings, or the establishment of a Line of Packet Ships for Passengers and Trade to and from India, fitted, like the "*Maria*," involves an outlay of capital, which few private individuals possess the means of expending.

The experiment referred to, forms our contribution towards effecting so great an improvement in Navigation; we have now only to express our undiminished confidence in Mr. Melville's Invention, and hope it may be generally adopted for the advancement of the Naval and Commercial Interests of our Country.

Your obedient Servants,

GARDNER, URQUHART, & Co.

Owners of the Ship "Maria."

ABSTRACT FROM LOG-BOOK of the Merchant Ship "Maria," 460 Tons (JAMES BLACK, Commander—GARDNER, URQUHART, & Co., Owners) laden with a general Cargo, and drawing 16 feet, 6 inches water, bound from London to Bombay. The first sailing Vessel fitted with Steam-power for occasional Aid during Calms or light Winds; shewing in what situations, and for what period, MELVILLE'S PATENT PROPELLERS, worked by Two Engines of Ten Horse Power each, (made by J. T. BEALE, East Greenwich,) were used on board the "MARIA."

Date.	Latitude.	Longitude.	Steam power in use.	*Remarks, Occurrences, &c. during the Voyage from London to Bombay.*
1838.			HOURS.	
Dec. 13			6	Calm and fine. At 11 A.M. left the W. I. Docks. Steamed down the River. At 5 P.M. anchored in the lower part of the Lower Hope.
14			7	Calm and light easterly airs. At 10 A.M. weighed and steamed to the Warp. At 5 P.M. anchored. Nore Light bearing W. by N.
15			2	Light winds and fine weather. At 2 P.M. weighed, and drove down to the Mouse, wind easterly. At 4 P.M. anchored near the Mouse Light.
16			8	Fresh E'ly winds and fine weather. At 7 A.M. weighed; got the steam up, and, assisted by the Lion Steam-tug, crossed the Flats. At 3 passed through the Downs.
31	29 40 N.	18 58 W.	4	Light winds, inclining to calm. At 3 P.M. commenced steaming. At 7 P.M. breeze freshened; let off Steam. W. Hone, Engineer, suspended for abusive conduct.
(39) Jan. 9	6 3	17 37	12	Light winds and hazy weather. At 6 P.M. commenced steaming. Blew off occasionally, and refilled the boilers. Broke bolt of feeding pump.
10	5 6	17 0	12	Light wind. At 6 P.M. commenced steaming; shipped the small paddles; packed the cylinders afresh; blew off occasionally, and refilled boilers.
11	4 2	16 8	16	Light winds, and sultry weather. At 6 P.M. commenced steaming; blew off occasionally, and refilled the boilers, losing an hour.
12	3 24	15 26	16	Light airs and calm. At 4h. 40m. commenced steaming; blew off occasionally; cleaned the flues, and repacked the cylinders as required.
13	2 54	15 48	18	Light airs and hot weather. At 1 P.M. commenced steaming. At 6 P.M. shifted the large paddles with the small ones. High S. E. swell.
14	2 12	15 21	11	Light airs and sultry weather. At 5 A.M. wind freshening; blew off the steam and unshipped the paddles. At 8 moderate breeze, and clear.
16	0 31	18 22	4	Light winds and clear weather. At 4 commenced steaming. At 8 blew off the steam. Lost a paddle, from the nuts coming off.

Date.	Latitude.	Longitude.	Steam-power in use.	*Remarks, Occurrences, &c. during the Voyage from London to Bombay.*
1839.			HOURS.	
30	29 23 S.	27 27	8	Light variable winds. At 5h .20m. commenced steaming. At 8 unshipped the paddles. At 7 A.M shipped the paddles, and commenced steaming.
31	30 16	26 5	10	Light winds and clear. At 3h. 30m. blew off the steam. At 5 commenced steaming. At midnight steady breeze; put out the fires.
Feb. 12	36 18	6 0	6	Light airs and heavy swell. At 2 P.M. commenced steaming; found Engineer neglectful and inefficient. At 8 unshipped the paddles.
Mar. 17	26 3	58 4 E	3	Light airs and calm. At 3 A.M. lighted the fires; but, owing to the ignorance and neglect of Engineers, did not get the steam up until 9 A.M.
18	24 26	57 32	5	Light winds and clear. Blew off occasionally. At 6h. 30m. P.M. let off the steam, and unshipped the paddles. Midnight breeze fresh.
24	13 8	56 0	7	Light variable winds with rain. At 5 A.M. commenced steaming; could not start the larboard engine: both Engineers ignorant of their duty.
25	11 38	56 6	17	Light winds. Blew off occasionally as required. At 5 A.M. breeze freshened; let off steam, and unshipped the lee paddles.
26	10 27	56 2	4	Light variable winds. At 4 A.M. kindled the fires; the Engineer having damaged the safety valve, did not commence steaming until 8 A.M.
27	9 18	55 51	19	Light variable airs. Blew off occasionally; handed the courses and small sails; lowered the top sails down; braced the yards sharp up.
28	8 3	56 11	6	Light breeze and clear. Blew off occasionally; cleaned the boilers and flues. At 6 A.M wind falling again, got the steam up.
29	7 20	56 24	13	Light winds and weather. Found blow-off pipe, starboard side, foul; let off steam, and cleared it; cleaned funnels and flues.
30	6 26	56 54	8	Light breeze and cloudy. Clued up all sails, and steamed ship within 3 or 4 points of the wind. Passed the Island of Cœtivy, distant 5 or 6 leagues.
31	5 29	57 24	19	Light variable airs and calms. Blew off occasionally. Force-pump out of order. Confined 2d Engineer, J. Clark, for theft and drunkenness.
April 1	4 9	58 0	19	Light winds and cloudy. Blew off occasionally. J. Clark confessed he had broached a cask of beer. Boarded by the ship "Argus" from Muscat.
2	2 40	59 29	18	Light variable winds and clear. Blew off occasionally. Cleaned boilers, funnels, and flues. Several of the crew refractory.
3	1 40	59 50	18	Light variable airs. All hands employed about the engines, boilers, funnels, &c., getting up coals, &c. Crew returned to their duty.
4	0 22	60 9	19	Light variable airs and clear. Blew off occasionally. Confined in irons Thomas Davis for mutinous conduct. Cleaned funnels and flues.

Date.	Latitude.	Longitude.	Steam-power in use.	*Remarks, Occurrences, &c. during the Voyage from London to Bombay.*
1839.			HOURS.	
5	0 42 N.	59 18	13	Steady breeze and clear. Blew off occasionally. Engineers cleaning boilers; crew employed trimming ship. Repaired force-pump.
6	1 20	58 38	6	Moderate breeze. At noon, the starboard foremost wheel-shaft broke close to the crank outside; stopped the engines; got the broken piece in.
7	1 51	57 11	18	Moderate winds. All sails set; kept the larboard engine going; blew off occasionally. For some time past used the condensed steam for drinking.
8	2 7	57 5	18	Light winds. Larboard engine working with regularity; blew off occasionally; cleaned the boiler; caught the condensed steam for use.
9	2 27	57 20	18	Light airs and calms. Larboard engine working. Engineer and Carpenter getting broken shaft out of the wheels of starboard engine.
10	3 0	57 35	20	Light airs and clear weather. Larboard engine working. Carpenter making a wheel-shaft with spar and iron bolts. Hone evidently quite at a loss.
11	4 0	56 40	20	Light airs and calms. Larboard engine working. Carpenter on the new shaft. Liberated Davis from confinement. Captain Black able to leave his bed.
12	5 7	56 22	8	Light airs. Larboard engine working; blew off occasionally. At 10 P.M. fresh breeze; let off the steam, and unshipped the paddles.
17	10 25	55 42	10	Light airs. At 4 finished the new shaft; kindled the fires; found the wooden shaft, at 8h. 30m. too weak; feed pump of larboard boiler choked; let off steam.
19	11 43	56 20	9	Light variable winds. At 3 P.M. finished repairs of force-pump; kindled the fires, and worked the larboard engine. Midnight, let off steam.
20	12 33	55 35	9	Moderate breeze and clear. At 10h. 30m. light airs; commenced working the larboard engine; blew off occasionally, and refilled boiler.
21	12 58	56 11	17	Light airs and calms. Larboard engine working; trimmed the yards as required; blew off occasionally, occasioning great detention.
22	14 4	57 16	8	Light variable winds. Mr. Watson, 2d Mate, rather better. Larboard engine working; Crew trimming sails, getting up coals, &c. as required.
30	18 54	67 29	4	Light winds and clear. Larboard engine working; took starboard engine down, and unshipped the wooden shaft; blew off at noon.
May 1	18 32	68 35	15	Light winds and weather. Larboard engine working; at 5 A.M. fresh breeze; blew off the steam, and made all possible sail.
4	Bombay Harbour.		3	At 5 A.M. weighed; kindled the fire, set the larboard engine working, and proceeded higher up Bombay Harbour; moored ship, and let off steam.
45 Occasions.			Hours 511	

The Steam-power, it thus appears, was used on forty-five different occasions, and during a period of 511 *hours* = 21 *days,* 7 *hours.*

List of Patents

Granted for Scotland subsequent to January, 1840.

To Robert Lorimer, of Glasgow, Brass-founder, for an improvement or improvements in stoves.—Sealed 25th January.

Miles Berry, of the Office for Patents, 66, Chancery-lane, London, patent agent, (communicated by a foreigner, residing abroad,) for an invention or discovery, by which certain textile or fibrous plants are rendered applicable to making paper, and spinning into yarns, and weaving into cloth, in place of flax, hemp, cotton, and other fibrous materials, commonly used for such purposes.—Sealed 27th January.

John Jones, of Westfield-place, Sheffield, for a new frying and grilling pan, for the cooking of steaks, chops, and other meats. —Sealed 29th January.

Robert Hervey, of Manchester, dry-salter, for certain improvements in the mode of preparing and purifying alum alumina, aluminous mordaunts, and other aluminous combinations and solutions, and the application of such improvements to the purposes of manufacture.—Sealed 31st January.

Francis Worrell Stevens, of Chigwell, Schoolmaster, for certain improvements in apparatus for propelling boats and other vessels on water.—Sealed 1st February.

William Isaac Cookson, of Newcastle-upon-Tyne, for certain improved processes or operations for obtaining copper and other metals from metallic ores.—Sealed 3rd February.

George Wilson, of St. Martin's-court, St. Martin's-lane, London, stationer, for an improved paper cutting machine.—Sealed 3rd February.

Miles Berry, of the Office for Patents, 66, Chancery-lane, London, patent agent, (communicated by a foreigner, residing abroad,) for certain improvements in machinery or apparatus for making or manufacturing pins and sticking them in paper. —Sealed 5th February.

Godfrey Anthony Ermen, of Manchester, cotton spinner, for certain improvements in machinery or apparatus for spinning, doubling, or twisting cotton, flax, wool, or other fibrous materials; part of which improvements are applicable to machinery in general.—Sealed 5th February.

James Capple Miller, of Manchester, for certain improvements in printing calicoes, muslins, and other fabrics.—Sealed 7th February.

John Alexander Philip de Val Marino, of 17, Clifford-street, London, for certain improvements in the manufacture of gas, and in the apparatus employed for consuming gas for the purposes of producing light.

John Francis Victor Fabien, of King-street, London, (communicated by a foreigner, residing abroad,) for improvements in pumps.—Sealed 12th February.

Jonathan Fell, of Workington, in the county of Cumberland, ship-builder, for improvements in building ships and other vessels.—Sealed 12th February.

John Reynolds, of Victoria Hotel, Euston-square, London, for improvements in the manufacture of salt.—Sealed 12th February.

Henry Pinkus, late of Pensylvania, now of 79, Oxford-street, London, for improvements in inland transit; some of which improvements are applicable to, and may be combined with an improved method of, or apparatus for communicating and transmitting or extending motive power, by means whereof carriages or waggons may be propelled on railways or roads, and vessels may be propelled on canals.—Sealed 19th February.

New Patents
SEALED IN ENGLAND.
1840.

To Moses Poole, of Lincoln's-inn, gentleman, for improvements in pumps for raising and forcing water and other fluids, being a communication.—Sealed 30th January—6 months for inrolment.

William Brockedon, of Queen-square, Middlesex, Esq., for improvements in the means of retaining fluids in bottles, decanters, and other vessels.—Sealed 31st January—6 months for inrolment.

Philippe Marie Moindron, of Bedford-place, Russell-square, merchant, for improvements in the construction of furnaces, and in boilers, being a communication.—Sealed 31st January—6 months for inrolment.

William Cubitt, of Gray's-inn-road, builder, for an improvement or improvements in roofing.—Sealed 31st January—6 months for inrolment.

Crofton William Moat, of Thistle-grove, Brompton, Esq., for a new and improved method of applying steam power to carriages on ordinary roads.—Sealed 5th February—6 months for inrolment.

Wilkinson Steele, and Patrick Sanderson Steele, manufacturing and furnishing ironmongers, of George-street, Edinburgh, for improvements in kitchen ranges for culinary purposes, and apparatus for raising the temperature of water for baths and other uses.—Sealed 5th February—6 months for inrolment.

William Isaac Cookson, of Newcastle-upon-Tyne, Esq., for certain improved processes or operations for obtaining copper and other metals from metallic ores.—Sealed 5th February— 6 months for inrolment.

Thomas Myerscough, of Little Bolton, Lancaster, manager, and William Sykes, of Manchester, machine-maker, for certain improvements in the construction of looms for weaving or producing a new or improved manufacture of fabrics; and also in the arrangement of machinery to produce other descriptions of woven goods or fabrics.—Sealed 5th February—6 months for inrolment.

Samuel Carson, of Caroline-street, Coles-hill, Eaton-square, gentleman, for improvements in apparatus for withdrawing air or vapours.—Sealed 5th February—6 months for inrolment.

Joseph Needham Taylor, of Plymouth, a post captain in the royal navy, for improvements in steam boats and vessels, making applicable the power of the steam engine to new and useful purposes of navigation.—Sealed 8th February—6 months for inrolment.

John Wertheimer, of West-street, Finsbury-circus, printer, for certain improvements in preserving animal and vegetable substances and liquids, being a communication.—Sealed 8th February—6 months for inrolment.

Robert Beart, of Godmanchester, miller, for improvements in apparatus for filtering fluids.—Sealed 8th February—6 months for inrolment.

Amand Deplanque, of Lisle, in the kingdom of France, but now residing in Leicester-square, gentleman, for improvements in looms for weaving, being a communication.—Sealed 8th February—6 months for inrolment.

Edmund Rudge, jun., of Tewkesbury, tanner, for a new method or methods of obtaining power for locomotive and other purposes, and of applying the same.—Sealed 8th February—6 months for inrolment.

James Hancock, of Gloucester-place, Walworth, for a method of forming a fabric or fabrics, applicable to various uses, by combining caoutchouc, or certain compounds thereof, with wood, whalebone, or other fibrous materials, vegetable or animal, manufactured or prepared for that purpose, or with metallic substances, manufactured or prepared.—Sealed 8th February—6 months for inrolment.

George Eugene Magnus, of Manchester, merchant, for certain improvements in manufacturing, polishing, and finishing slate, and in the application of the same to domestic and other useful purposes.—Sealed 8th February—6 months for inrolment.

Robert Willis, of the University of Cambridge, clerk, for improvements in apparatus for weighing.—Sealed 12th February—6 months for inrolment.

David Napier, of York-road, Lambeth, engineer, for improvements in the manufacture of projectiles.—Sealed 12th February—6 months for inrolment.

Antoine Blanc, of Paris, merchant, and Theophile Gervais Bazille, of Rouen, merchant, for certain improvements in the manufacturing or producing soda and other articles obtained by or from the decomposition of common salt or chloride of sodium.—Sealed 12th February—6 months for inrolment.

Thomas Robinson Williams, of Cheapside, gentleman, for certain improvements in the manufacture of woollen, and other fabric or fabrics, of which wool or fur forms a principal component part, and in the machinery employed for effecting that object.—Sealed 14th February—6 months for inrolment.

Joseph Clarke, of Boston, printer, for improvements in piano-fortes.—Sealed 14th February—6 months for inrolment.

Gerard Ralston, of Tokenhouse-yard, merchant, for improvements in rolling puddle balls or other masses of iron, being a communication.—Sealed 22nd February—6 months for inrolment.

Richard Cuerton, jun., of Percy-street, Middlesex, brass-founder, for improvements in the manufacture of cornices, mouldings, and window sashes, being a communication.—Sealed 22nd February—6 months for inrolment.

Thomas Kerr, of Forecrofts, Dunse, in the county of Berwick, Esq., for a new and improved mortar or cement for building; also for mouldings, castings, statuary, tiles, pottery, imitations of soft and hard rocks, and other useful purposes; and which mortar or cement is applicable as a manure for promoting vegetation and destroying noxious insects.—Sealed 22nd February—6 months for inrolment.

William Cook, of King-street, Regent-street, coach-maker, for improvements in carriages.—Sealed 22nd February—6 months for inrolment.

John Hanson, of Huddersfield, engineer, for certain improvements in meters for measuring volumes of gas, water, and other fluids, when passed through them; and in the construction of cocks or valves, applicable to such purposes.—Sealed 22nd February—6 months for inrolment.

William Winser, of Rathbone-place, artists' colourman, for a certain method or certain methods of preserving and using colours.—Sealed 22nd February—6 months for inrolment.

Job Cutler, of Lady Poole-lane, Birmingham, gentleman, and Thomas Gregory Hancock, of Highgate, Birmingham, aforesaid, mechanist, for an improved method of cutting corks, and constructing the necks of bottles.—Sealed 22nd February—6 months for inrolment.

William Brindley, of Northwood-street, Birmingham, for improvements in apparatus employed in pressing cotton, wool, and goods of various descriptions.—Sealed 25th February—6 months for inrolment.

Thomas Huckvale, of Over Norton, Oxford, farmer, for improvements in ploughs.—Sealed 25th February—6 months for inrolment.

Thomas Farmer, of Gunnersbury House, near Acton, Middlesex, Esq., for improvements in treating pyrites to obtain sulphur, sulphuric acid, and other products.—Sealed 25th February—6 months for inrolment.

John Wilson, of Liverpool, lecturer on chemistry, for an improvement or improvements in the process or processes of manufacturing the carbonate of soda.—Sealed 25th February—6 months for inrolment.

Richard Kingdon, of Gothic House, Stockwell, surgeon, for certain improvements in apparatus for the support of the human body, and the correction of curvatures and other distortions of the spine of the human body.—Sealed 25th February—6 months for inrolment.

Thomas Milner, of Liverpool, safety-box manufacturer, for certain improvements in boxes, safes, or other depositories, for the protection of papers or other materials from fire.—Sealed 26th February—6 months for inrolment.

William Morrett Williams, of Bedford-place, Commercial-road, professor of mathematics, for an improved lock and key.—Sealed 27th February—6 months for inrolment.

CELESTIAL PHENOMENA, FOR MARCH, 1840.

D.	H.	M.	
1			Clock before the sun, 12m. 34s.
	—		☽ rises 5h. 58m. M.
	—		☽ passes mer. 10h. 3m. M.
	—		☽ sets 2h. 17m. A.
3			☉ eclipsed, invis. at Greenwich
	21	44	Her: in conj. with the ☽ diff. of dec. 1. 50. S.
4	4	5	Ecliptic conj. or ● new moon
4	6	19	♃ stationary.
	10	4	☿ in conj. with the ☽ diff of dec. 2. 38. S.
	11	55	♀ in the descending node.
	17	52	♃'s first satt. will im.
	20	5	♂ in conj. with the ☽ diff. of dec. 3. 4. S.
5			Clock before the sun, 11m. 42s.
	—		☽ rises 6h. 57m. M.
	—		☽ passes mer. 1h. 14m. A.
	—		☽ sets 7h. 50m. A.
6	8	31	Her: in conj. with the ☉
7	31		☽ in Perigee
9			Pallas greatest hel. lat. N.
	1	3	☿ in the ascending node.
	12		☿ in conj. with ♂ diff of dec. 0. 49. N.
10			Clock before the sun, 10m. 27s.
	—		☽ rises 8m. 47s. M.
	—		☽ passes mer. 5m. 49s. A.
	—		☽ sets 1m. 43s. M.
	11	8	☽ in □ or first quarter.
11	9	42	♄ in □ with the ☉
13	14	14	♃'s first satt. will im.
	14	31	☿ in Perihelion
	—		Occul 39 Cancri im. 16h. 42m. em. 16h. 55m.
15			Occul *a* Leonis im. 7h. 10m. em. 8h. 21m.
17			Mercury R. A. 0h. 52m. dec. 7. 25. N.
	—		Venus R. A. 21h. 45m. dec. 14. 13. S.
	—		Mars R.A. 0h. 31m. dec. 2. 41. N.
	—		Vesta R. A. 16h. 9m. dec. 11. 51. S.
	—		Juno R. A. 3h. 40m. dec. 8. 7. N.
	—		Pallas R. A. 18h. 52m. dec. 10 30. N.
	—		Ceres R. A. 19h. 28m. dec. 23. 46. S.
	—		Jupiter R. A. 15h. 5m. dec. 16. 7. S.
	—		Saturn R. A. 17h. 24m. dec. 21. 42. S.
	—		Georg. R. A. 23h. 13m. dec. 5. 49. S.
	—		Mercury passes mer. 1h. 11m.
	—		Venus passes mer. 22h. 5m.
	—		Mars passes mer. 0h. 50m.
	—		Jupiter passes mer. 15h. 22m.
	—		Saturn passes mer. 17h. 40m.
18	4	31	Ecliptic oppo. or ○ full moon
			Occul χ Virginis im. 16h. 1m.
19			Juno greatest Hel. Lat. S.
20			Clock before the sun, 7m. 34s.
	—		☽ rises 9h. 23m. A.
	—		☽ passes mer. 1h. 22m. M.
	—		☽ sets 6h. 22m. M.
	0	41	☉ enters Aries, Spring commences
	8	19	☿ greatest elong. 18. 31. E.
	16	8	♃'s first satt. will im.
21	22	52	♃ in conj. with the ☽ diff. of dec. 6. 33. N.
23	7		☽ in Apogee.
	22	28	☿ greatest Hel. Lat. N.
	12	22	♃'s second satt. will im.
24	15	27	♄ in conj. with the ☽ diff. of dec. 6. 32. N.
25			Clock before the sun, 6m. 2s.
	—		☽ rises 2h. 4m. M.
	—		☽ passes mer. 5h. 18m. M.
	—		☽ sets 8h. 31m. M.
26	6	42	☽ in □ or last quarter
27	12	16	♃'s third satt. will im.
	14	22	♃'s third satt. will em.
28	7	6	☿ stationary
29	12	30	♃'s first satt. will im.
30			Clock before the sun, 4m, 30s.
	—		☽ rises 4h. 36m. M.
	—		☽ passes mer. 9h. 29m. M.
	—		☽ sets 2h. 34m. A.
	14	55	♃'s second satt. will im.
	17	27	♄ stationary.
	21	50	♀ in conj. with ☽ diff. of dec. 1. 47. S.
	—		Occul λ Aquarii im. 18h. 8m.
31	10	26	Her: in conj. with the ☽ diff of dec. 2. 1. S.

J. LEWTHWAITE, Rotherhithe.

LIST OF PLATES IN VOL. XV.

[CONJOINED SERIES.]

I. Sewell's White Lead Apparatus; Du Maurier's Carriage Springs; Tigar's Wheel; and Heathcoat's Apparatus for Ornamenting Gauze.
II. Fletcher's Improved Loom; Smith's Boiler; and Jones's Spinning Machinery.
III. Topham's Sluice Cocks, and Fairbairn's Loom for Weaving Ribbons.
IV. Newton's Drilling Machine; Darthez's Axletree; and Thomas's Apparatus for Stopping Horses.
V. Heginbotham's Propelling Apparatus; Hawkshaw's Railway Signals; and Hall's Lubricating Apparatus.
VI. Sewell's White Lead Apparatus, and Jones and Mellodew's Loom.
VII. Callet's Improvements in Producing Motive Power; Hoard's Apparatus for Refining Sugar; and Lukyn's Improvements in fixing Artificial Teeth.
VIII. Captain Smith's Improvements in Steam Vessels; Lund's Corkscrew; Cottam's Railway Wheels; and Tait's Harbour of Refuge.
IX. Whitworth's Mule.
X. Abraham's Improved Cocks, and Hughes's Improvements in Stocks for the Neck.

XI. Bourne and Bartley's Wheels; Horton and Smith's Pit Chain; and Goodfellow's Pistons.
XII. Wright's Bleaching Apparatus.
XIII. Prosser's Improved Boilers and Stoves.
XIV. Horsfield's Corn Mill; Palmer's Improvements in Inland Navigation; and Stocker's Chimney Sweeper.
XV. Happey's Improvements in Paving, and Hall's Furnace.
XVI. Overton's Biscuit Machinery; Faulkner's Pump; Nasmyth's Bearings; and Nash's Improved Bridges.
XVII. Grime's Improvements in Making Wheels.
XVIII. Williams's Improved Furnace.
XIX. Green's Apparatus for Making Brass and Copper Tubing, and Green's Oven.
XX. Essex's Improved Paddle Wheels; Jefferies's Smelting Apparatus; Bright's Candlestick; and Garnett's Carding Engine.

Sewell's Imp.d White Lead Ap.ts

Fig.2

Fig.1

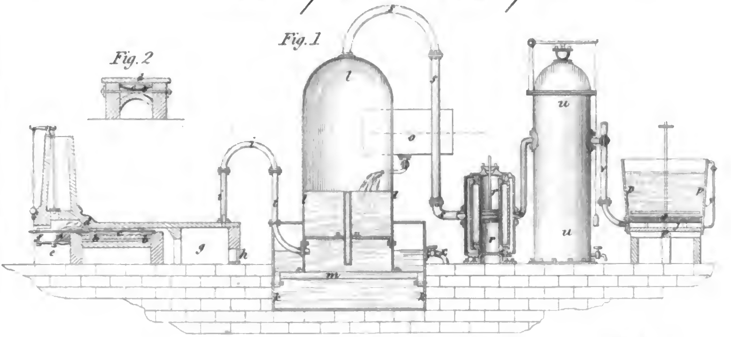
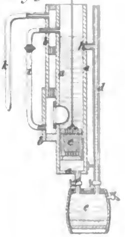


Fig.3



Du Maurier's Imp.d Carriage Springs

Fig.4

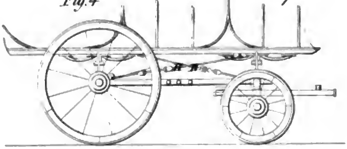


Fig.6

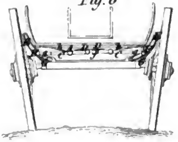


Fig.5

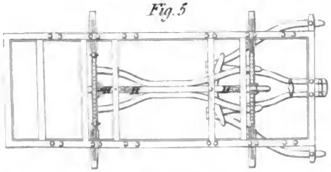
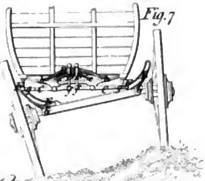
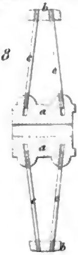


Fig.7



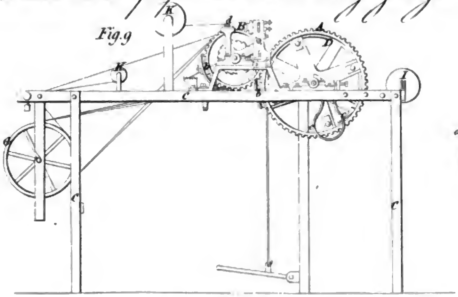
Figar's Wheel

Fig.8



Heathcoat's Ap.ts for Ornamenting Gauze

Fig.9



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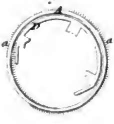
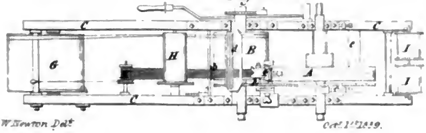


Fig.13

Fig.10



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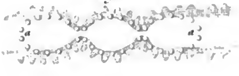
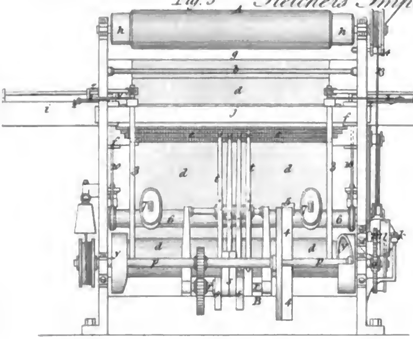


W. Newton Delt. Oct. 1st 1839. T. Sherratt

Fletcher's Impd Power Loom

Fig. 3



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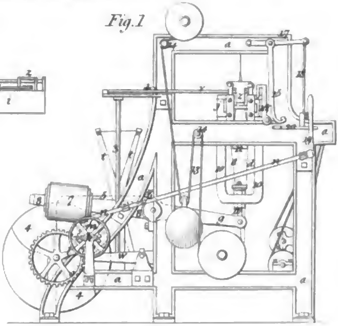

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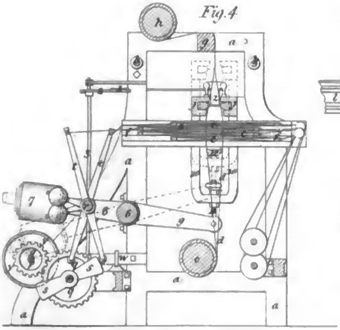

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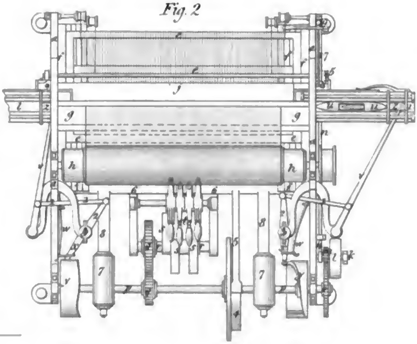
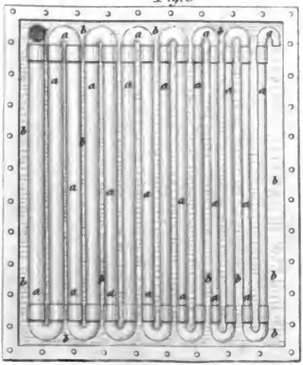


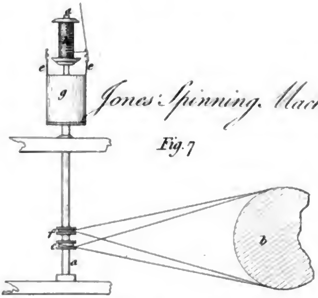
Smith's Boiler

Fig. 5



Jones' Spinning Machine

Fig. 7



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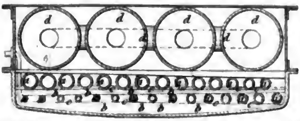
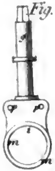


W. Newton Delt Octr 1st 1839 T. Sherratt Sculpt

Topham's Improved Sluice Cocks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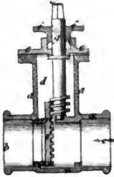
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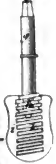
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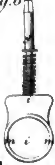
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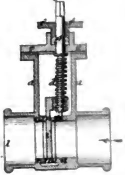
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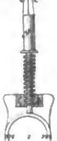
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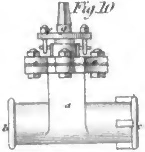
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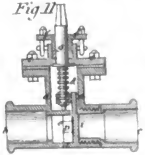
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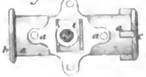
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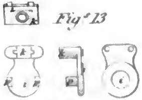
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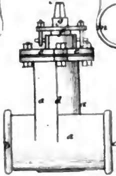
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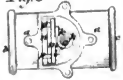
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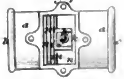
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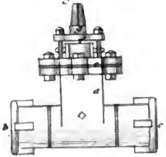
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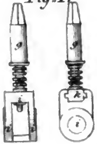
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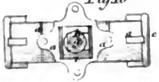
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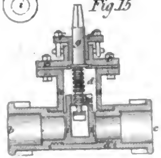


Fig. 15

Fairbairn's Improvements in Weaving Ribbons

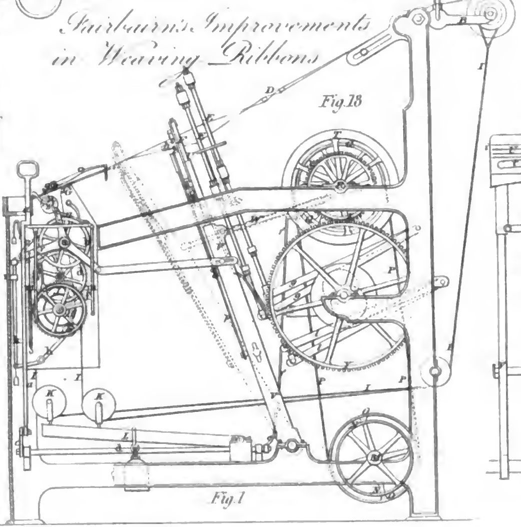


Fig. 18

Fig. 1

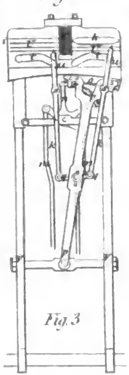


Fig. 20

Fig. 3

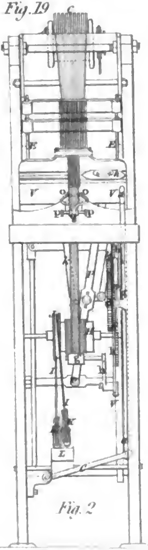


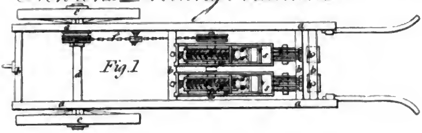
Fig. 19

Fig. 2

W. Newton Del.t Oct.r 1st 1839 J. Basire Sculp.t

Newton's Drilling Machine

Fig. 1



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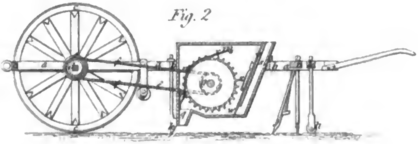
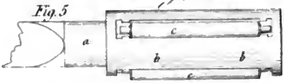


Darthez' Axletree

Fig. 5



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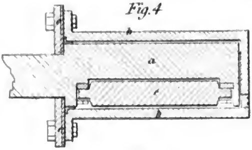

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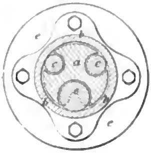

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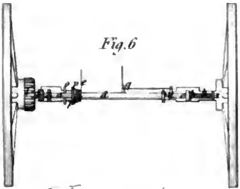

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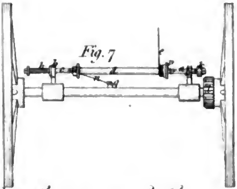
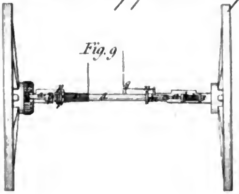


Thomas' Apparatus for Stopping Horses

Fig. 9



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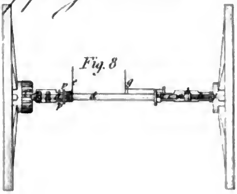

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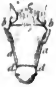

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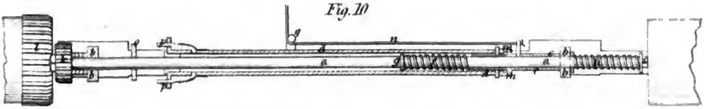

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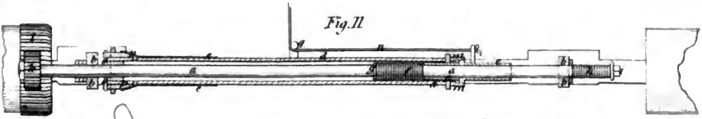

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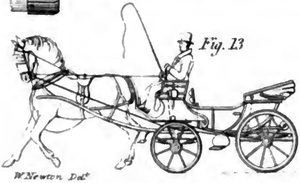

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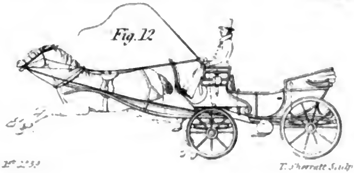
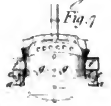


W. Newton Delt Oct. 1st 1839 T. Sherratt Sculpt

Higinbotham's Impts in Propelling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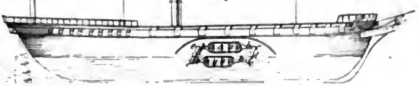
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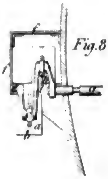
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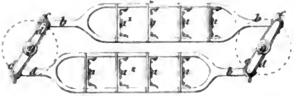
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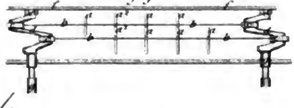
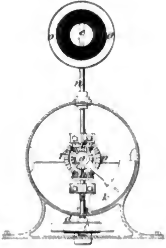


Fig. 9

Hawkshaw's Railway Signals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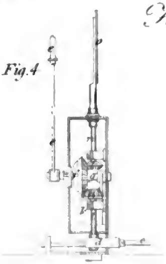
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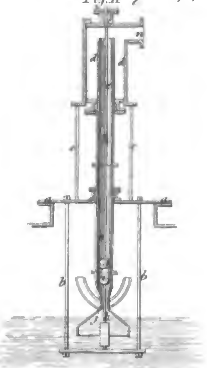
Hall's Lubricating App: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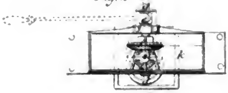
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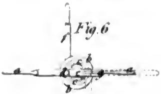
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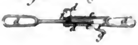
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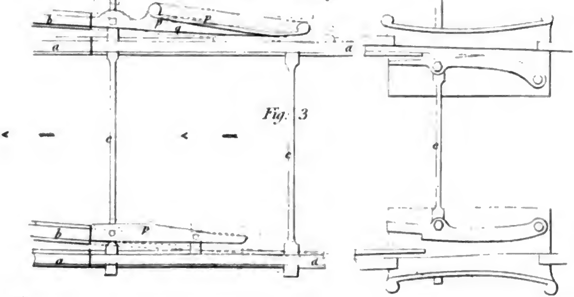
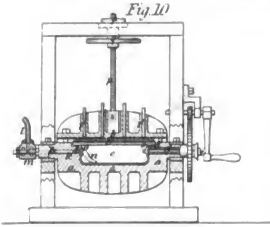


Fig. 3

W. Newton Delt 1st Jan. 1839. A. V. Newton Sculpt

Sewell's White Lead Apparatus



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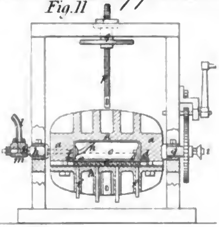

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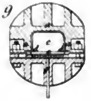

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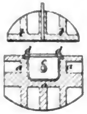


Fig. 8

Jones and Melloden's Loom

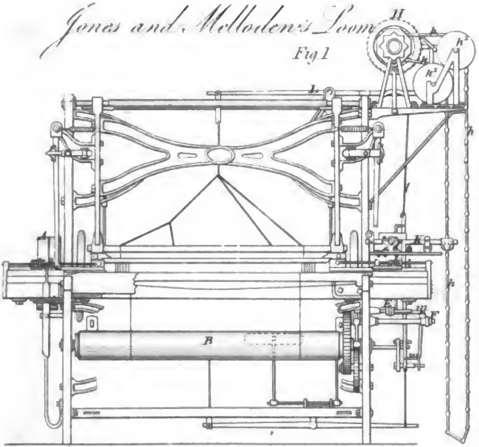
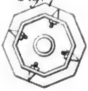


Fig. 1

Fig. 13

Fig. 12



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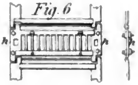

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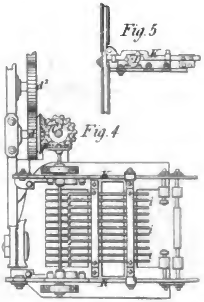

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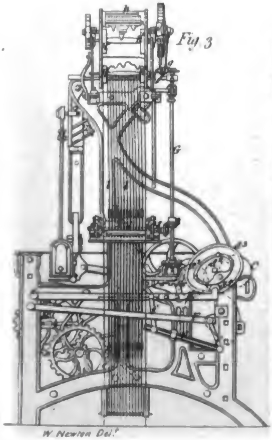

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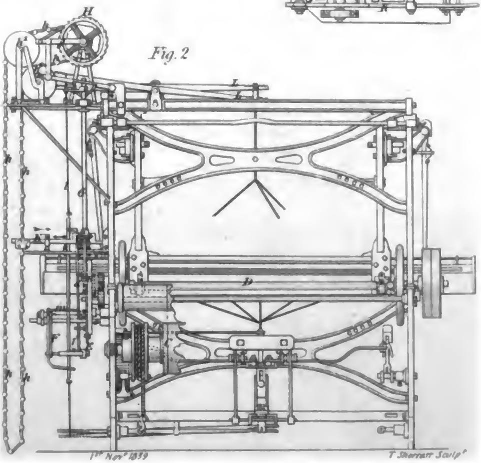
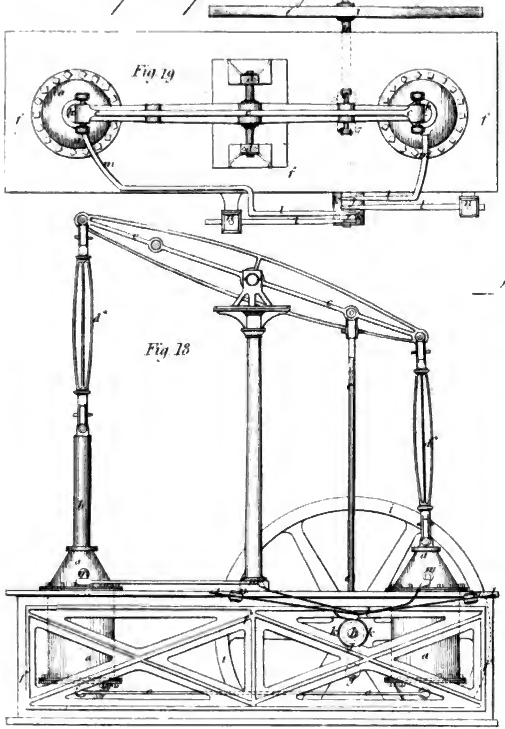


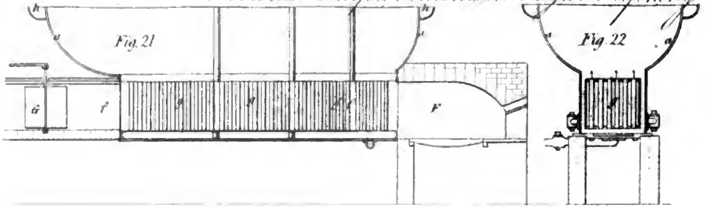
Fig. 2

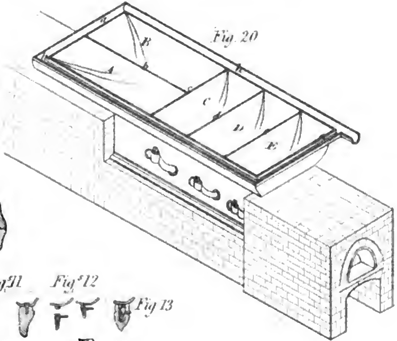
W. Newton Del.^t 1st Nov.^r 1839 T. Sherratt Sculp.^t

Vallet's Imp.ts in producing Motive Power

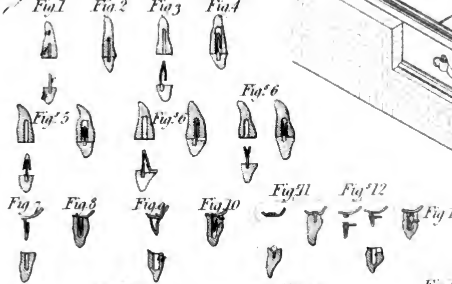


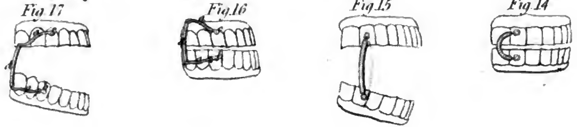
Hoard's Improvements in Sugar Refining





Lukyn's Artificial Teeth





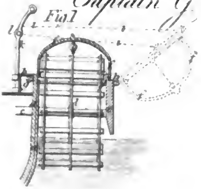
W. Newton Del.t

1st Nov.r 1844

A V Newton Sculp.t

Captain G. Smith's Improvements in Steam Vessels

Fig 1



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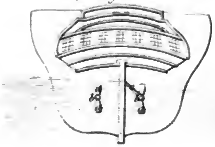

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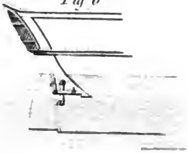

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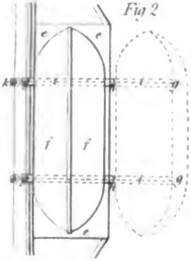

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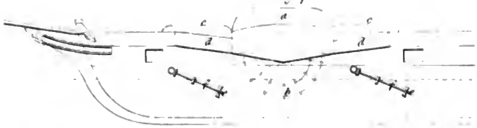
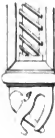


Lund's Cork Screw

Fig 11



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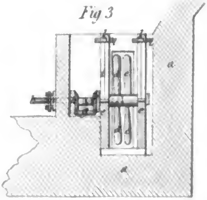
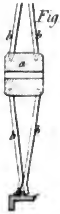


Cottam's Wheels

Fig 8



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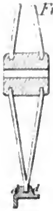

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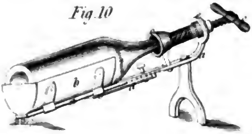

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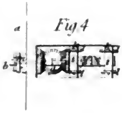
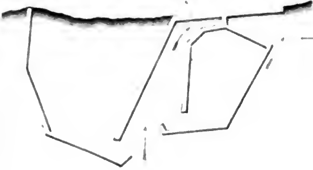
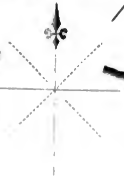


Tait's Harbour of Refuge

Fig 12





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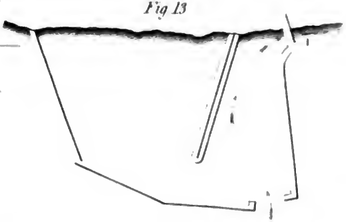
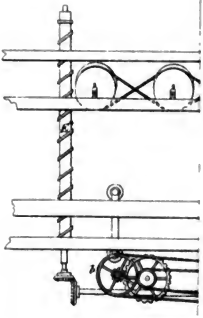
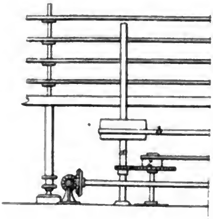


W. Newton Del.

1st Nov 1839





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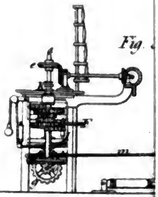

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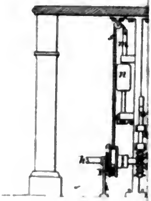
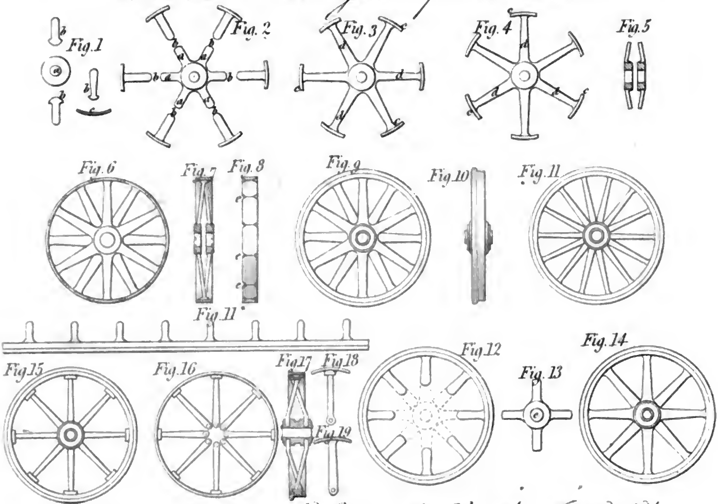
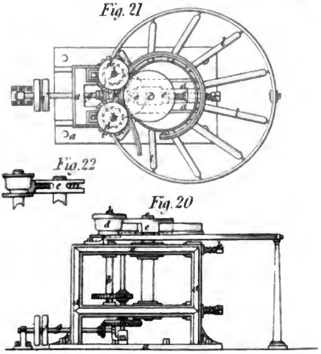


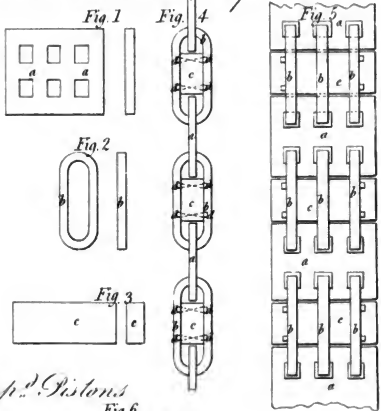
W. Newton Del.

Bourne & Bartley's Improved Wheels

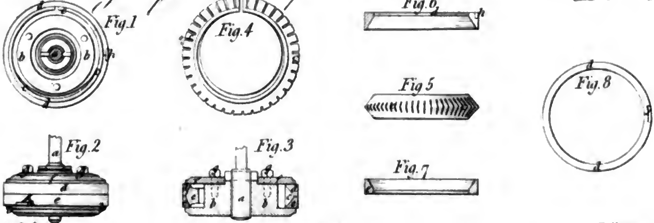




Horton & Smith's Impd. Chain

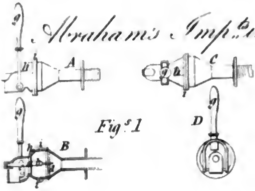


Goodfellow's Impd. Pistons



W. Newton Delt. Decr. 1st 1839 T. Sherratt Sculpt.

Abraham's Impts. in regulating the supply of Water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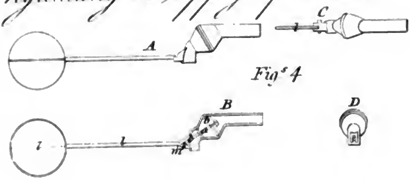
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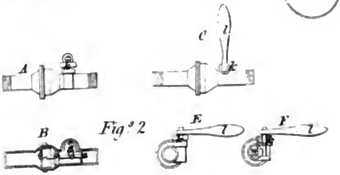
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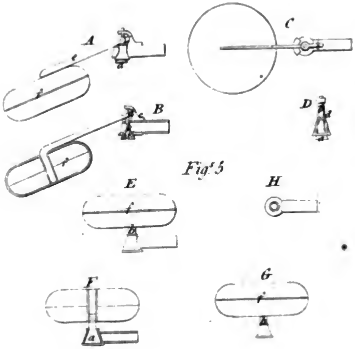
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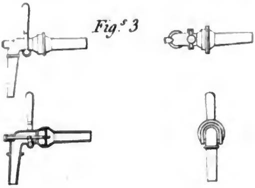
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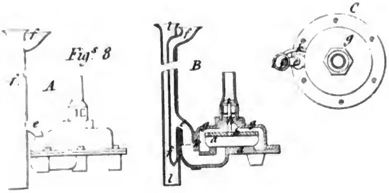
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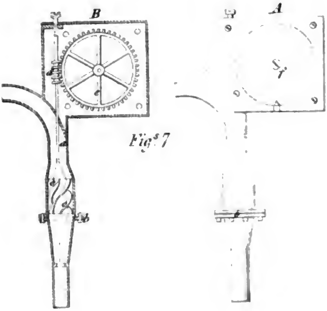
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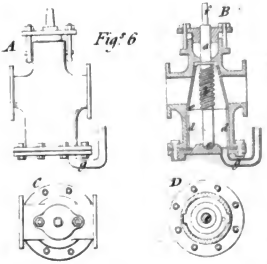
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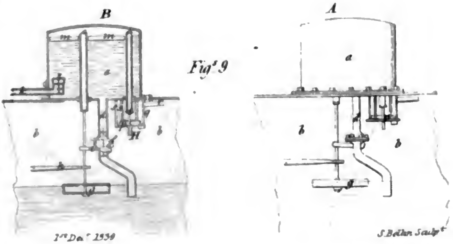

Figs. 9

Hughes' Impts. in Stocks

W. Newton Del.

1st Dec. 1839

S. Bellin Sculpt.

Fig. 2

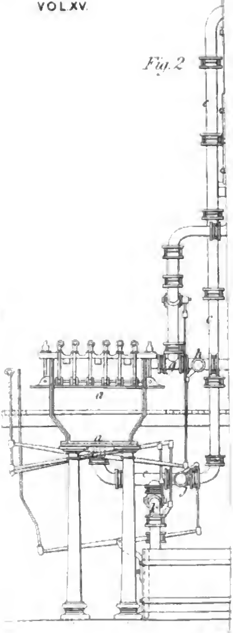
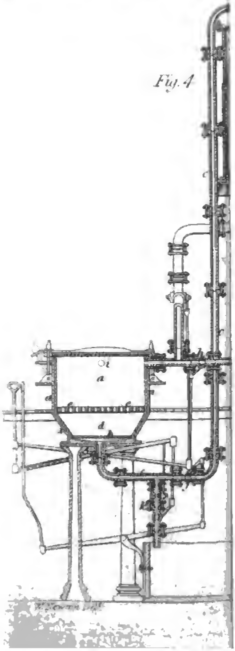


Fig. 4

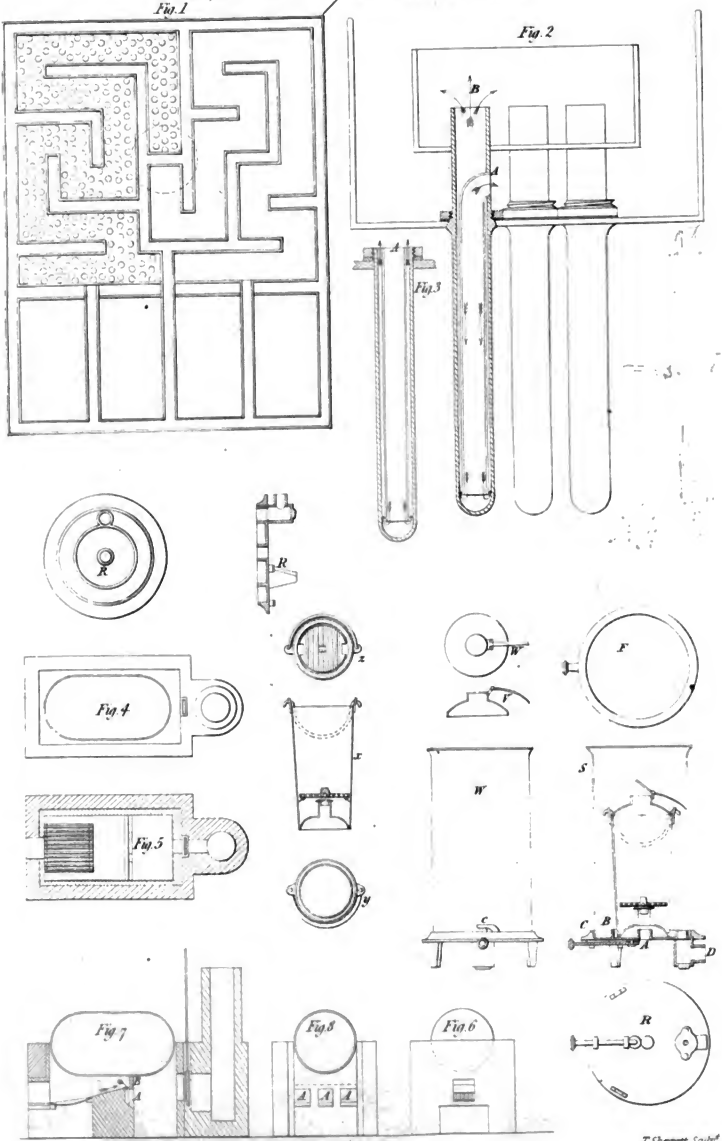


VOL. XV

CONJOINED SERIES

PLATE XIII

Prosser's Improved Boilers



W. Newton Del.t

1st Jan.y 1840

T. Sherratt Sculp.t

Horsfield's Corn Mill

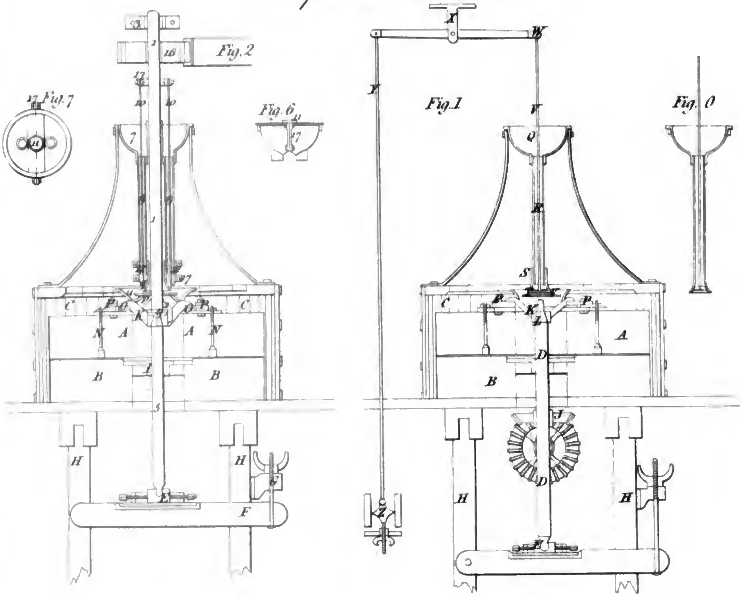


Fig. 2
Fig. 7
Fig. 6
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Fig. 10

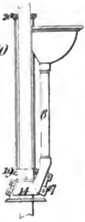
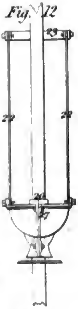


Fig. 11

Fig. 12



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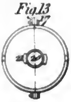


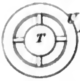
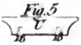


Fig. 4

Fig. 5



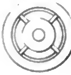
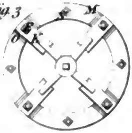


Fig. 9

Fig. 3



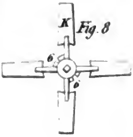
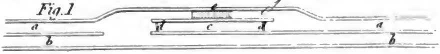


Fig. 8

Palmer's Inland Navigation

Fig. 1



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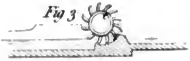

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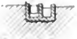
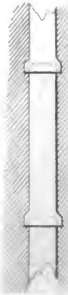


Stöcker's Chimney Sweeper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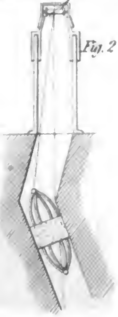
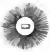


Fig. 2

Fig. 3



W. Newton Del^t. 1st Jan^y 1840. J. Bellin Sculp^t

Happey's Impt. in Paving

Fig. 1

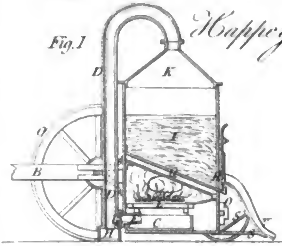
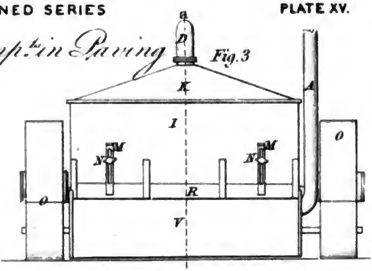


Fig. 3



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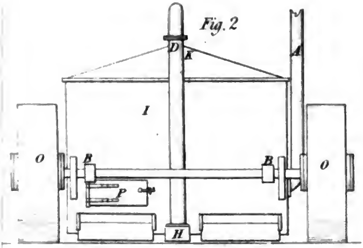

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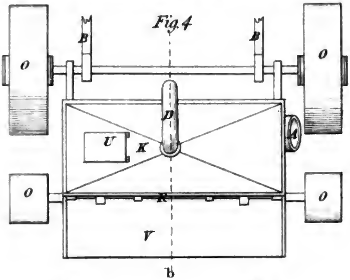

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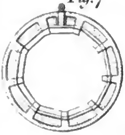

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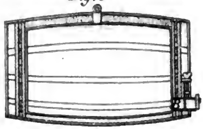

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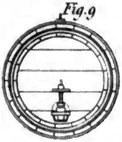

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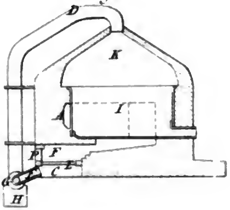

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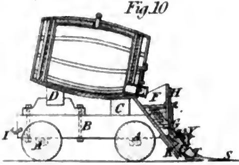

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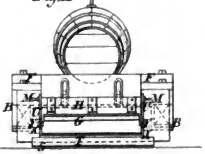

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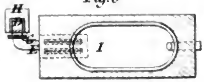


Hall's Improved Furnace

Fig. 1

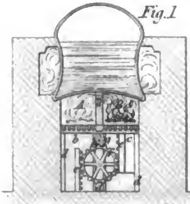
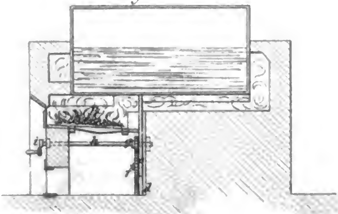
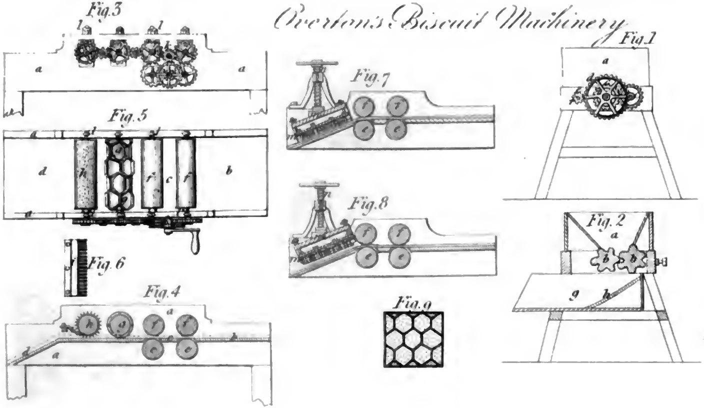


Fig. 2

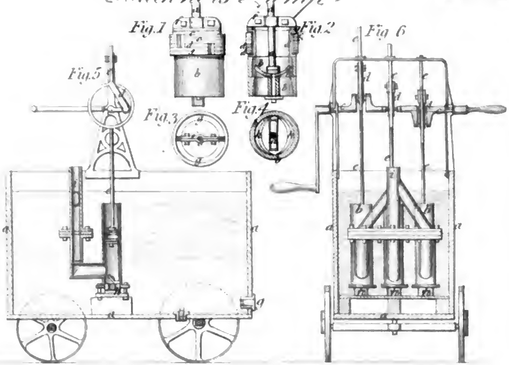


W Newton Deln   1st Feby 1840   T. Sherratt Sculpt

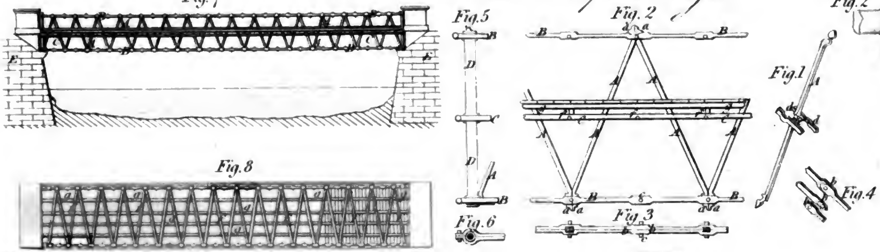
Overton's Biscuit Machinery



Faulkner's Pump



Nash's Impd Bridges



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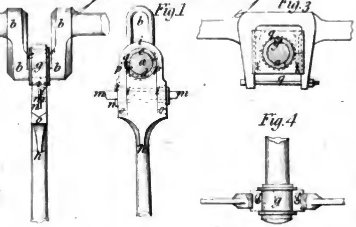
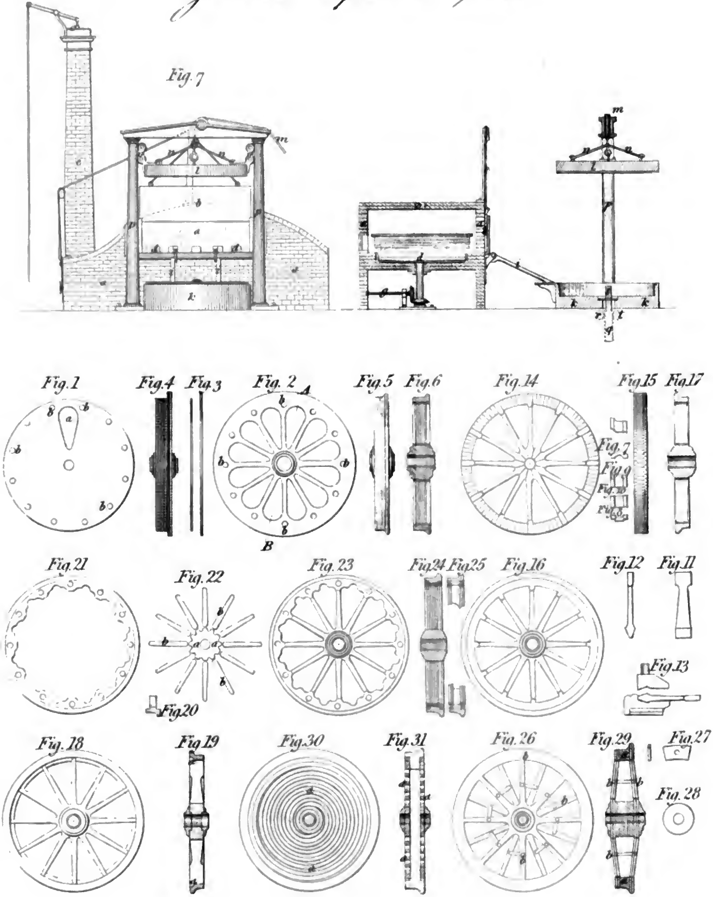


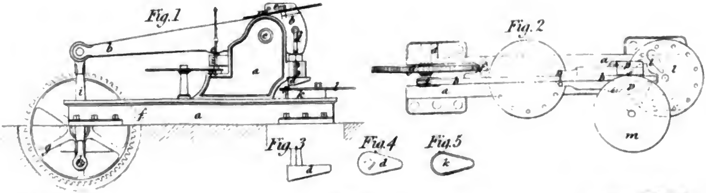
W. Newton Delin

1st Feby 1840

C.J. Malby Sculpt

Grime's Improved Wheels





William's Improved Furnaces

Fig. 1

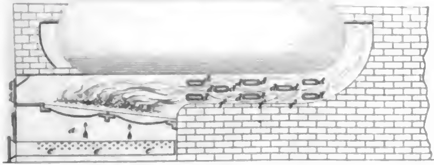


Fig. 3

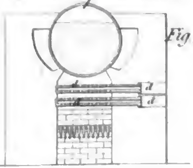


Fig. 15

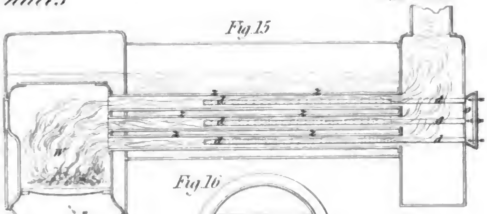


Fig. 16

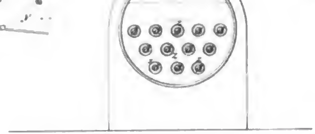


Fig. 2

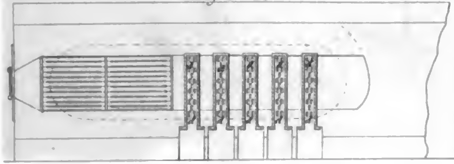
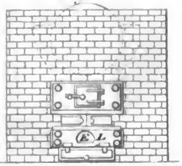


Fig. 4



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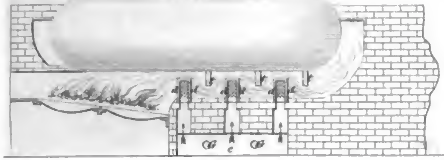

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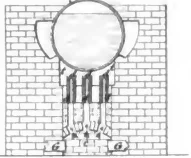

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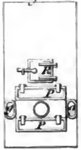

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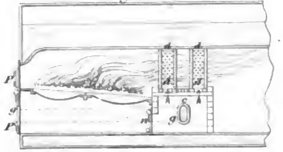

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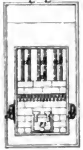

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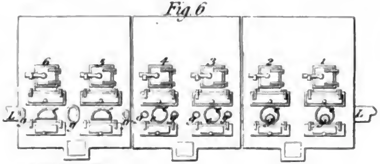

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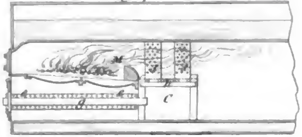

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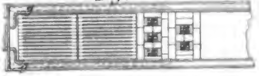

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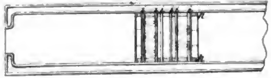

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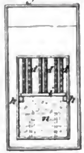


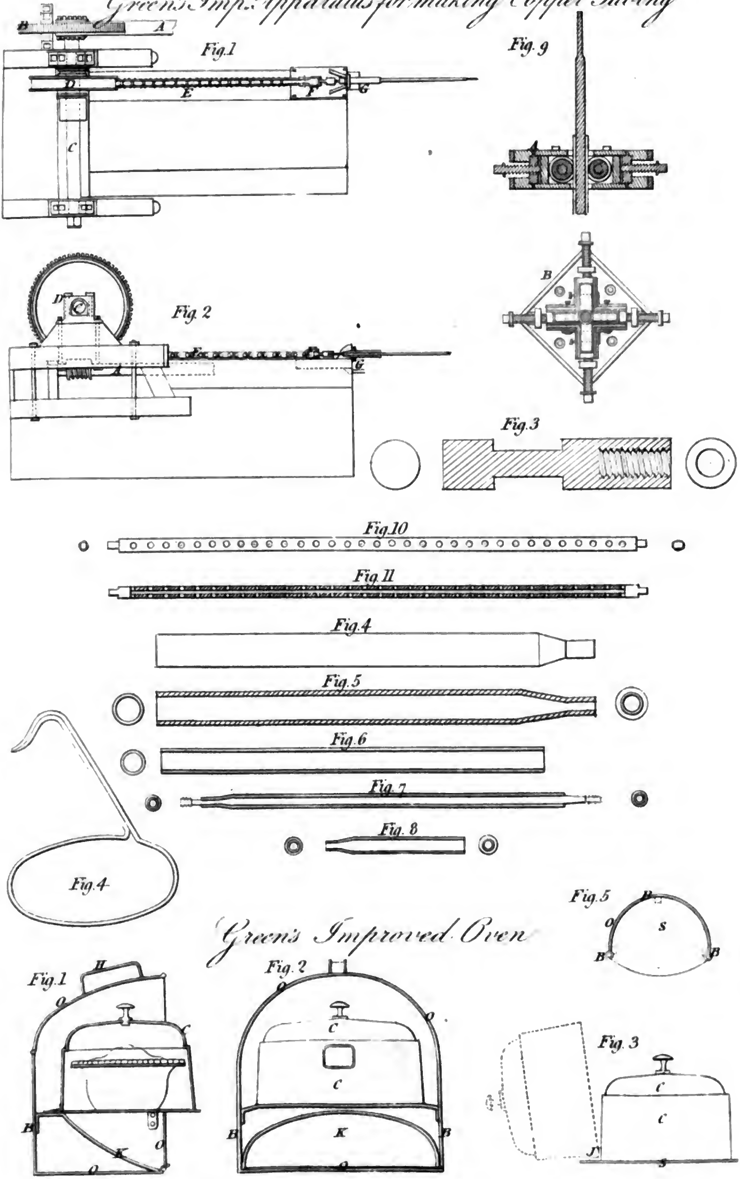
W. Newton Del.

March 1, 1840

T. Sherratt Sculp.

Green's Impd. Apparatus for making Copper Tubing

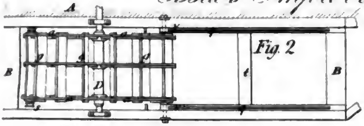
Green's Improved Oven



W Newton Delt
1st March 1843.
J Basire Sculpt

Esser's Improved Paddle Wheel

Fig. 2



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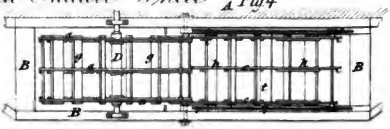


Fig. 1

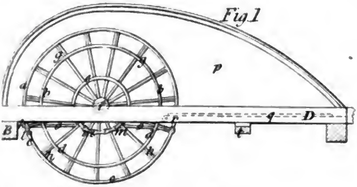
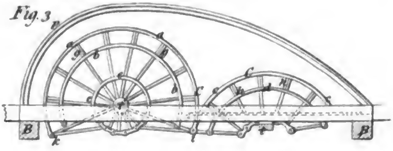


Fig. 3



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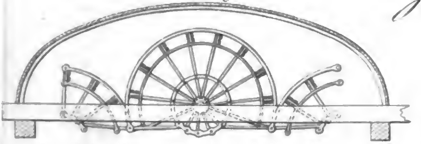
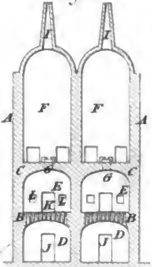


Jefferies Smelting Apparatus

Fig. 1



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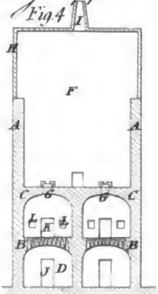

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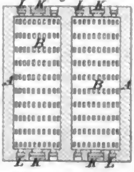
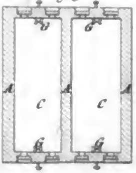


Fig. 3



Garnett's Imp^d Carding Engine

Fig. 3

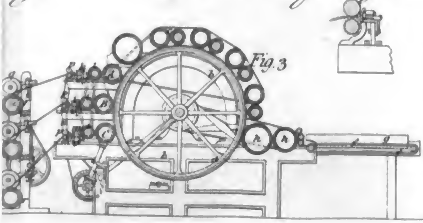


Fig. 1

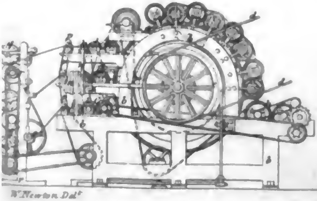
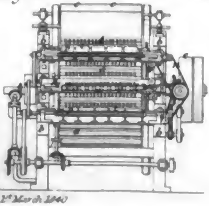
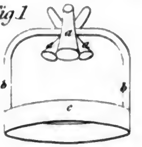


Fig. 2



Bright's Candlestick

Fig. 1



W. Newton Del^t

1^st March 1840

T. Sherratt Sculp^t

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